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REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

VOL. III.

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ERRATA.

Page	3	line	20	for	“*Pthirius*”	read	“*Phthirius*”
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,,	29	,,	19	,,	“Skaloznkov”	,,	“Skalozubov”
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Identification of Blood-sucking Diptera collected in the Gambia.—*Ann. Rept. Gambia Med. Dept., 1913, London,* 1914, p. 45, [Received 26th November 1914.]

The following CULICIDAE and TABANIDAE collected by Dr. Hopkinson, D.S.O. are recorded: *Anopheles funestus*, Giles, *Culex fatigans*, Wied., *Mansonioides africana*, Theo., and *Stegomyia fasciata*; *Chrysops longicornis*, Macq., *Tabanus biguttatus*, Wied., *T. ditaeniatus*, Macq., *T. par*, Walk., *T. sticticollis*, Surc., *T. taeniola*, P. de B., var. *variatus*, Walk., and two undetermined species of *Tabanus*.

The flies collected by Dr. A. F. Kennedy included *Glossina morsitans* and *G. palpalis*, and *Tabanus laverani*, Surc., *T. taeniola*, P. de B., var. *variatus*, Walk., and an undetermined species of *Tabanus*; *Culex fatigans* and the Hippoboscid, *Lynchia maura*, Big., were also taken.

CELLI (A.). **La Malaria in Italia durante il 1912.** [Malaria in Italy during the year 1912.]—*Ann. Igiene Sperimt., Torino,* 1914, xxiv, pt. 2, pp. 177–244.

Galli Valerio and J. R. De Jong have continued their studies of the habits of CULICIDAE, confirming previous observations that even small pools of water, especially in woods, serve as breeding places for mosquitos. *A. nigricans* has been found in Switzerland for the first time and it appears probable that it has a wide distribution. Its favourite breeding places are collections of water in the trunks of trees. In Sicily, the commonest Anopheline is *A. claviger* and a curious habit of the larvae of this insect is recorded. They not only attach themselves to various objects or stretch themselves at full length on fallen leaves, but also arrange themselves in rows, in which position they sail on the surface of the water before the wind. Although the larvae of *Anopheles* prefer clean water, it is not uncommon to find them in foul water, especially during a dry season, when they appear to be able to adapt themselves to unfavourable conditions to a large

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extent. In Sicily, Anopheline larvae have been found by three observers in very foul water and on one occasion in water which was strongly impregnated with salt. With regard to the destruction of mosquitos, heavy oils present the advantage of a lower price and a lower rate of evaporation, but do not cover the surface so well as ordinary petroleum and consequently leave spaces in which the larvae can obtain access to the air. A good covering of algae acts in much the same way as a layer of petroleum. Valerio and De Jong have suggested the use of sunflower oil. This must be applied to the surface of the water with a rag or cloth soaked in the oil; the use of this oil is especially suggested for water tubs and other receptacles in gardens where it is desirable to avoid the offensive odour of petroleum. For the destruction of the adults, the use of sulphur and tobacco smoke is too expensive and pyrethrum is more or less ineffective. Fumigation with chinolein, at the rate of 1 gram per cubic metre, is very efficacious and also kills house-flies. D. Marras has experimented on the effect of the smoke from the seeds of various indigenous and exotic plants for killing mosquitos and a lengthy list of seeds experimented with is given. No relation between the irritating action of the smoke of these seeds upon the nasal mucous membrane and their value in killing mosquitos was found; some of those which had the least effect on human beings having the greatest culicidal action.

Mosquitos in the Bahamas.—*Bahamas Medical Report for the year 1913.* (Received from the Colonial Office.)

Culex fatigans, *Stegomyia fasciata* and unidentified Culicine larvae were found on 80 premises inspected in Nassau. On certain city premises not less than 15 tubs, all containing *S. fasciata*, were counted and rubbish of various kinds, old pots, tins, etc., capable of serving as breeding places were found on 80 per cent. of the lots in Grant's Town and on 56 per cent. of the lots in the city. The destruction of all bush, weeds and long grass near dwellings is emphasised as of importance, owing to the cover it offers for this kind of rubbish and also to the mosquitos themselves; 50 per cent. of the lots in Grant's Town and 39 per cent. of those in the city contained overgrowth of this description. Natural holes in the rock were not found to be breeding places for mosquitos as often as might have been expected and larvae were only found in six of these. The presence of tadpoles seemed to be the explanation, for wherever fully-grown tadpoles were present, larvae were invariably absent, and the author of the report thinks that the seasonal variation in the number of tadpoles probably accounts very largely for the greater prevalence of mosquitos at one time than another, other conditions such as the amount of rain, etc., remaining the same.

S. fasciata was found much more frequently in the city than in the Grant's Town districts, the ratio being 1·6 to 1, and the presence of this insect is regarded as a constant menace to the reputation of Nassau as a winter resort. Complaint is made that the regulations as to mosquito extermination are inoperative and that no legal proceedings can be taken on them. Neither Anopheline larvae nor adults were found, but further investigation will probably reveal their presence since cases of malaria exist.

KELLOGG (V. L.). **Ectoparasites of Mammals.**—*Amer. Nat., New York*, xlviii, no. 569, May 1914, pp. 257–279. [Reprint received 23rd December 1914].

This interesting paper deals with the relations existing between mammals and their Mallophagan and Anopluran parasites.

Of the Anoplura of the CERCOPITHECIDAE, nine of the ten species belong to the genus *Pedecinus*, long recognised as the characteristic genus of the lower monkeys, as contrasted with the genus *Pediculus*, characteristic of the anthropoid apes and man. Among the SIMIIDAE, two gibbons, *Hylobates syndactylus* from Sumatra, and *H. leuciscus* from Borneo, are infested by a single species of *Pediculus*, not elsewhere recorded, which is common to them both, while the chimpanzee has also a single species of *Pediculus* which is peculiar to it. It is also a remarkable fact that three species of the genus *Ateles*, which has been considered by some authorities to replace the Anthropoids in the New World, have yielded three species of *Pediculus*. No species of *Pedecinus* has been found on a Simian host.

Man is the host of three well-known Anoplura, two of which are species of *Pediculus*, and the third the only known representative of the genus *Pthirius*. All these parasites occur on man in all parts of the world, but variations among them exist, perhaps the most curious being a tendency to a darker coloration of individuals which occur on the bodies of men of the dark-skinned races. There is no doubt that the close physiological relation between parasite and host makes their host distribution significant of genetic relationship, and this commonness of one type of parasite to man and the apes, and its limitation to these hosts and replacement on the lower monkeys by another type, is an indication of the actual close relationship of the Simians and man, which is apparently greater than that between the Simians and the lower monkeys.

The belief gained by the author from a study of the distribution of the bird-infesting Mallophaga, that the host distribution of the permanent wingless ectoparasites of birds is determined more by the genetic relationships of their hosts than by geographical factors, is confirmed by the present study of the mammalian parasites. These facts have the important corollary that the distribution of the parasites may often have a valuable significance as to the genetic relationships of animals whose genealogic affinities are not clearly understood.

NEUMANN (L. G.). **Parasites et Maladies Parasitaires du Chien et du Chat.** [Parasites and parasitic diseases of the Dog and Cat.] Paris: Asselin et Houzeau, 1914, 348 pp., 156 figs. Price 4 fr. 50.

This book is a treatise on the parasitic diseases, internal or external, of dogs and cats, the parasite in each case being described and figured. The following is a brief summary of that part of the book which is of entomological interest.

The dog flea is noticed as the carrier of *Dipylidium caninum*, the common tape-worm of the dog. A good method of ridding dogs of fleas is to dip them, hind legs first, in a bath of 2½–3 per cent potassium sulphide in warm water. The immersion should be conducted slowly so that the liquid may thoroughly penetrate the hair. A 2 per cent. solution of creoline is almost equally effective and both are greatly superior to 1 per cent. carbolic acid, which should never be used for cats. A good plan for ridding a cat of fleas is to cut a square of cotton wool large enough to envelop the animal, place this on a piece of calico with the cat in the centre, then spray the fur rapidly with camphorated alcohol and wrap the animal's body in the cotton wool, tying the corners of the square of calico round its neck. Many of the fleas seek refuge in the head and may be combed out, but large numbers will be found entangled in the cotton wool, which may be burned. Chiggers, *Dermatophilus penetrans*, attack sheep, goats, dogs, and especially pigs. A related species, *Echidnophaga larina*, occurring at the Cape, in Abyssinia and in Somaliland, attacks wild mammals and also dogs. Chiggers usually infest the feet of dogs, but frequently also the ears. Affections of the skin are caused by various lice, *Haematopinus pilifer*, *Trichodectes latus* and *T. subrostratus*. *Haematopinus* especially frequents long-haired sporting dogs; *Trichodectes*, smaller house dogs and toy dogs with long hair. *Trichodectes latus* is possibly the intermediate host of a *Taenia*. Among dipterous parasites, the larvae of *Wohlfartia* (*Sarcophaga*) *magnifica*, Schiner, are frequently found in the ears of dogs, according to Portchinsky. *Cordylobia anthropophaga* attacks dogs in Africa and cases are quoted in which five or six larvae per diem were taken from one dog for several weeks together. A larva of *Cuterebra emasculator*, Fitch, has been taken from a dog at Montreal and another case is reported in a cat. The larva of *Dermatobia cyaniventris* is said by Coquerel and Salle to be very common in dogs in Brazil. The eggs are laid on leaves in damp places frequented by *Janthinosoma lutzi*, Theo., and becoming attached to the mosquito, the larvae are thus carried to the animal host [see this *Review*, Ser. B, i, p. 106].

Ornithodoros moubata, Murray, is the only Argasid which attacks dogs, but the numerous Ixodid ticks which have been found to infest them include :—*Ixodes ricinus*, L., *I. hexagonus*, Leach, *I. pilosus* in N. Africa; *I. pilosus howardi*, Nm., in Natal and the Transvaal; *I. ovatus*, Nm., in Japan; *I. holocyclus*, Nm., in Queensland; *I. scapularis*, Say, in Florida and Texas; *I. rasus*, Nm., in the Congo; *Haemaphysalis flava*, Nm., in Japan and China; *H. concinna kochi*, Nm., and *H. neumanni*, Dönitz, in Japan; *H. leachi*, Aud., in Africa; *Dermacentor reticulatus*, F., and *D. variabilis*, Say, in North America. *Rhipicephalus sanguineus* specially affects the dog and is the intermediate host of *Haemogregarina canis*. The following ticks have also been found on dogs in various parts of the world: *Rhipicephalus bursa*, Can., *R. simus*, Koch; *R. punctatissimus*, Gerst., *R. capensis*, Koch, *R. evertsi*, Nm., *R. appendiculatus*, Nm., *R. pulchellus*, Gerst., *R. tricuspis*, Dön., *R. texanus*, Banks, *Margaropus annulatus*, Say, *Hyalomma aegyptium*, L., *Amblyomma cajennense*, F., *A. calcaratum*, Nm., *A. striatum*, Koch, *A. fossum*, Nm., *A. americanum*, L., *A. maculatum*, Koch, *A. hebraeum*, Koch, *Aponomma exornatum*, Koch, *A. inornatum*, Banks. Ticks are best removed from dogs by touching with a drop of benzol, petrol or turpentine. Cats are rarely attacked by ticks.

Among the Acarids causing disease in dogs and cats, *Tydeus molestus*, Moniez, has been found in Belgium and is believed to have entered the country in guano from Peru imported to an isolated farm on the grass land of which it increased with extraordinary speed and attacked all the live stock as well as man. *Trombidium holosericeum* and other species cause great annoyance to sporting dogs and sometimes to cats. Zürn and Mégnin report cases of dogs and cats attacked by *Dermanyssus gallinae*, Redi. *Sarcoptes scabiei*, Lat., attacks the dog and the cat; a large species, probably that of the pig, *S. scabiei suis* (*S. squamifer*, Fürst.) has been found on a dog by Cadiot and Raillet. The pathological conditions produced by *Demodex folliculorum canis* (*D. caninus*, Tulk.) are fully discussed. *Sarcoptes cati*, Herring, generally attacks old individuals among cats, but the author thinks this is merely the result of greater exposure to infection. *S. cati* may be transferred to the horse by cats sleeping in the stable and is communicable to man. Treatment is difficult in the cat, but a one per cent. solution of zinc chloride is said to be very effective. *Demodex folliculorum cati*, which resembles that of the dog, but is smaller, has been found in the external meatus of the ear.

Grassi's filaria, *Filaria* (*Acanthocheilonema*) *grassii*, Noè, is conveyed to dogs by *Rhipicephalus sanguineus*. More than fifty species of trypanosomes have been described as attacking mammals, of which about one-half are not pathogenic. Dogs may be inoculated with any form, but are normally attacked by seven varieties which, if not promptly treated, generally cause death, viz., *T. evansi*, *T. annamense*, *T. togolense*, *T. brucei*, *T. dimorphon*, *T. congolense* and *T. pecaudi*. Surra has attacked sporting dogs imported from England into Bombay, Burma and the Punjab, and during the epidemic of surra in Mauritius (1902–04) several dogs died of the disease. Leishmaniasis is common in dogs in North Africa and is transmissible to man by the dog flea, *Ctenocephalus canis*. Visentini reported that the destruction of starving dogs in the Lipari Islands acted as a prophylactic against the spread of the disease to man. Piroplasmosis (babesiasis) in dogs is known in all tropical countries and in some others, and imported dogs are peculiarly liable to be attacked. The disease is conveyed in France by *Dermacentor reticulatus* and possibly by *Ixodes ricinus*; in South Africa by *Haemaphysalis leachi*; in India by *Rhipicephalus sanguineus*. Another form, *Piroplasma gibsoni*, Patt., of which the jackal is probably the reservoir, is carried by a tick closely related to *R. simus*. *Haemogregarina canis*, which does not seriously affect the dog's health, is said by Christophers to be carried by *R. sanguineus*. *Dirofilaria immitis*, Leid., is very widespread, especially in China and the East. No breed of dog is immune and the larger dogs are specially attacked; the disease is rare in small house dogs, at least in Europe. Grassi and Noè have shown that *Anopheles maculipennis*, Meig., is the intermediate host of *D. immitis*, in which it develops in the Malpighian tubules. *Dirofilaria repens*, Railliet and Henry, lives in the subcutaneous connective tissues of the dog, and the embryos in the blood. The animals do not appear to be seriously affected as a rule, but Guby and Delafond have observed epileptiform attacks in dogs infested with this parasite. *Stegomyia fasciata*, F., is the intermediate host, and the development of the embryo is identical with that of *D. immitis* in *A. maculipennis*; it is possible that the latter insect also serves as an intermediate host. The principal parasites which attack the ears of dogs and cats are the mites, *Chorioptes cynotis canis* and *C. cynotis felis*, which produce acute tympanitis. Ferrets are liable to the attacks of *Sarcoptes scabiei furonis*, Raill., which differs in some characters from *S.*

scabiei of the dog, and is slightly larger. In 1884, a serious epidemic of parasitic otitis in ferrets occurred all over the north of France, especially near Calais, due to *Chorioptes cynotis furonis*, Mégnin. The animals did not appear to suffer such pain as dogs and cats attacked by parasitic otitis, but the death rate was very heavy.

TODD (J. L.). **Paralysis and Tick-Bite.**—*Canadian Med. Assoc. Jl., Toronto*, iv, no. 9, September 1914, pp. 825–826.

Paralysis ascribed to the bites of ticks has been observed in children and possibly adults—in the latter in British Columbia alone—in British Columbia, Oregon, Wyoming, Montana and Australia, whilst a paralysis of sheep is attributed to the same cause in British Columbia and South Africa. The ticks belong to three or more species. Paralysis has been experimentally produced in lambs and in a dog by the bites of *Dermacentor venustus*. The paralysis is quite distinct, both from the recognised diseases known to be transmitted by the bites of ticks to men, and from certain other insufficiently defined affections which have been described as due to tick bites. A young child, perfectly well one day, has more or less complete paresis or paralysis on the next, fever, a rapid pulse and other constitutional symptoms being also present in most cases. The child may be dull and stupid and may have convulsions. If the tick is not found and removed, the child may die, but if it is removed, the symptoms disappear, recovery being complete within a few hours. The tick should be entirely removed or local inflammation may result. Gentle traction often causes the tick to loose its hold, or the minute portion of skin, in which the mouth parts are buried may be removed with scissors. The author hopes that every case ascribed to ticks will be carefully examined and recorded. [See this *Review*, Ser. B, i, p. 204].

OWEN (G. E.). **Mechanical Transmission in Trypanosomiasis.**—*Jl. Com. Path. Therapeut., London*, xxvii, no. 3, September 1914, pp. 259–260.

It is suggested that mechanical transmission in trypanosomiasis can become a serious factor, given suitable opportunities. Between 1908 and 1913, some 2,500 to 3,000 head of cattle died of the disease in the Barotse reserve of Northern Rhodesia, which is free from *Glossina morsitans*. The wet months are from December to March and biting flies are most numerous at this season. The mortality began each year about the beginning of February and practically ceased after June. Although there were some dozen horses in this region (some bred every year), and numerous dogs, sheep and goats, no cases of natural infection among them are known. The strain of trypanosome in question was not, however, pathogenic to cattle only, for it was found that horses, sheep, goats and dogs were all easily infected by inoculation, particularly dogs. Transport riders with dogs lost many of their oxen, but never any dogs. One trader, who lost at least 1,000 head of cattle, bred horses on the very spot where his cattle died in numbers, but had no losses (except from South African horse sickness). In seeking for an explanation of these facts, the first point requiring notice is that trypanosomiasis was definitely confined to certain herds, others grazing over the same ground being free, and in every infected native herd there was a history of exchanging cattle with, or temporary hiring to, traders or transport riders. In 1908, a cattle-owner came into the district with sick cattle and lost most of them in three years from trypanosomiasis. With his advent, the disease became very noticeable. In 1912, the author was sent to investigate and at once resorted to isolation, with the result that over 800 head of cattle, the then survivors of 1,100, suffered no loss in 1913 in the area which was the centre of disease in 1912. They were carefully watched for about six months after the fly season, all infected and suspected animals being removed before the flies again became numerous. During April and May, 1912, some 200 cases were seen, whereas between February and May, 1913, only five cases were discovered, every one of which occurred in a suspected herd. If a cyclical transmitter had been present, isolation would have been useless, as the disease could not have been confined to certain herds. Had ticks played the part of intermediary host the disease would have spread likewise. TABANIDAE and *Stomoxys* are the commonest and most numerous blood-sucking flies in the district. They become very numerous in December and remain so until about the middle of April. From January to April, *Tabanus fuscipes* swarms in thousands. When these flies are numerous and most active, during the heat of the day, the cattle crowd together for mutual protection and the conditions are consequently extremely favourable for mechanical transmission. As an experiment, two kraals, A and B, were erected within ten yards of each other on the 25th February 1913. One contained two healthy cows and a heifer, and they were still healthy in July, when the author left. The other kraal contained two healthy tested cows and two infected ones. The healthy cows were found to be infected on the 12th and 26th April respectively. The cattle from the two kraals were allowed to graze over the same ground, but never together. The kraals were occasionally changed to see if mosquitos in them would act as transmitters. Dogs, sheep and goats were exposed to infection by mixing infected and healthy animals, but no infection resulted. TABANIDAE and *Stomoxys* were fed for cyclical and mechanical transmission, but no positive results were obtained. Dogs allowed *Stomoxys* to feed freely, but never TABANIDAE, biting furiously at these on their approach. It is therefore concluded that mechanical transmission took place with TABANIDAE as the agent, and that cattle only became infected because of the extremely favourable circumstances obtaining, viz., the crowding of them together in the day-time. The identity of the trypanosome concerned was not ascertained. The course of the disease in cattle was chronic.

JACK (R. W.). **Tsetse Fly and Big Game in S. Rhodesia.**—*Bull. Entom. Research, London*, v, pt. 2, September 1914, pp. 97–110, 2 maps.

This article discusses the problem as to whether the presence of big game is necessary for the well-being of *Glossina morsitans*. Game is fairly abundant all the year round in the fly belts of S. Rhodesia, and never altogether absent. Two districts, along the Gorai and Hanyani Rivers, appeared to be exceptions to this, fly being abundant along the Gorai in October and November, when there is no game there, and scarce on the west bank of the Hanyani, where game is normally abundant at that time. But it is contended that in the former area the absence of big game is only temporary, while the continued presence of wart-hog and duiker, afford a constant supply of food for the fly, and shade conditions are excellent in that neighbourhood ; shade conditions, however, along the Hanyani are bad, the banks being too thickly wooded for *G. morsitans* and the neighbourhood too open to afford shade. It is claimed that there is a vital association of *G. morsitans* with big game on the ground that it retired before the advance of civilisation in the Transvaal, where, for many years, the wholesale destruction and driving away of the larger fauna was the sole modification of natural conditions due to the advent of the European, and no extensive clearing of the forest occurred until after the fly had disappeared. Tsetse is stated to have disappeared from large tracts of country immediately after the outbreak of rinderpest in 1896, and has never reappeared in certain localities on the Limpopo and Sabi Rivers, in Bulalima-Mangwe and Bubi districts, near Selukwe in the Gwelo district, along the Zambesi near the Victoria Falls or in the Wankies district ; but in an editorial note it is stated that in many of these areas the fly had already gone before the destruction of the game by rinderpest. In other areas a nucleus was left, but large tracts of country were free which are now infested, notably that between the Hanyani and Angwa Rivers. A nucleus probably remained in the Lomagundi district and has extended greatly in recent years ; in the Urungwe sub-district odd specimens were encountered at a number of isolated spots between 1905 and 1910, and the fly seems to have survived the rinderpest in very small numbers in scattered localities, and, though failing to increase to any extent, persisted until recent years. Tsetse has increased and spread since the rinderpest only in those parts of S. Rhodesia where big game has increased, notably in the Sebungwe area, west of the Sengwa River, where there have been no Europeans living. A map shows the limits of the fly in Sebungwe in 1896, 1904, 1907, 1910 and 1914 respectively. Tsetse has greatly decreased of late years in the Hartley district in those parts where the big game has been most effectively destroyed or driven away. An area including the Hartley fly belts was shot over to a great extent from 1905–1908 and from 1909 onwards, with the result that the district is almost destitute of the larger fauna, while all evidence from Europeans and natives agrees that the fly was more numerous before 1909 than afterwards. The main obstacle to the acceptance of the theory of big game being necessary to the tsetse is the fact that many possible sources of blood other than that of ungulates exist in the African forests, but the vast bulk of these cannot, in the opinion of the author, serve as permanent sources of food supply. It is stated that *G. morsitans* is rarely found in the haunts of reptiles or amphibia, while Insectivora, Cheiroptera and Edentata may be excluded on account of their nocturnal habits. Avian blood is a possible source of food, but the auther considers that birds are but rarely attacked by this tsetse. The smaller antelopes and Quadrumana provide an irregular food supply, but it is contended that the food essential to the continuance of the fly is only provided by the larger Ungulata. Evidence in S. Rhodesia is against the existence of a special association between tsetse fly and buffalo, the distribution of the two not being generally coincident.

Bacot (A. W.). **The Influence of Temperature, Submersion and Burial on the Survival of Eggs and Larvae of** *Cimex lectularius*.—*Bull. Entom. Research, London,* v, pt. 2, September 1914, pp. 111–117, 1 table.

In the author's experiments, the eggs of *C. lectularius* survived exposure to temperatures between 40° and 50° F. for 31 days and between 28° and 32° F. for 48 hours; if exposed to the latter temperature for 5–8 days, only 25 per cent. of the eggs hatch, and longer exposures, 10–15 days, are fatal. Temperatures from 60–98° F. are favourable, but 113° F. prevents hatching. Submergence in water at between 60° and 63° F. for five days has no effect on hatching, if the eggs are subsequently kept under favourable conditions; they survived for at least three days in water at between 45° and 50° F., and for 48 hours, when the water in which they were submerged was frozen. Submergence in lime-water (saturated solution) for 46 hours was fatal, but the eggs survived partial embedding in a wet plaster surface, provided that emergence was not interfered with.

Newly-hatched bugs, when unfed, can survive a temperature of 28°–32° F. for periods up to 18 days, and can withstand chilling, thawing, and rechilling and again thawing for shorter periods; when subjected to cold, moist air after a full meal they are liable to a heavy or even total mortality, probably in consequence of humidity rather than cold. Between 60°–65° F. they may live for 136 days unfed, and after a meal for nine months; unfed, at 75° F., with humidity between ·65 and ·7, their average life is 10 days, though individuals survived 21 days. At 88° F., with humidity between ·7 and ·8, the average life is seven days, the longest survival being 11 days; at 96° F., with humidity at ·25, the average life is five days, the longest survival eight days; exposure to 113° F. is fatal within a few minutes. This temperature is also fatal to *Xenopsylla cheopis* in a few minutes, while 117° F. proved fatal within 15 or 20 minutes to two larvae of a cockroach, *Periplaneta americana,* and to a hibernated specimen of a blue-bottle fly, *Calliphora erythrocephala.*

Hirst (S.). **Preliminary List of the Acari occurring on the Brown Rat (***Mus norvegicus***) in Great Britain, with the Description of a New Species (***Haemogamasus oudemansi***)**.—*Bull. Entom. Research, London,* v, pt. 2, September 1914, pp. 119–124, 3 plates, 3 figs.

This list includes: *Laelaps echidninus*, blood smears from which, when bred on apparently healthy rats, sometimes contain a bacillus closely resembling that of plague, *Eulaelaps stabularis*, Koch, *Hypoasis hypudaei*, Oudms., *Haemogamasus hirsutus*, Berl., *H. nidi*, Mich., *Eugamasus loricatus*, Wankel, *Euryparasitus terribilis* Mich., *Asca affinis*, Oudms., *Ixodes tenuirostris*, Neum, *Notoedres muris*, Megn., and *Myobia ensifera*, Poppe, very abundant on tame white rats in London. Of these, *L. echidninus*, *N. muris*, and *M. ensifera* are restricted to *M. norvegicus*, and *H. oudemansi*, Hirst, sp. n., has also only been found on this host, but the others are frequently found on other mammals or in their nests, especially in those of the mole.

Edwards (F. W.). **New Culicidae from Borneo and Hong Kong.**—*Bull. Entom. Research, London,* v, pt. 2, September 1914, pp. 125–128.

The following new species of Culicidae are recorded:—*Armigeres moultoni,* sp. n., from Sarawak and Malay States; *A. brevitibia,* sp. n., *A. hybridus,* sp. n., *A. conjungens,* sp. n., all from Sarawak; *Culex virgatipes,* sp. n., from Hong Kong and Kashmir; *Lophoceratomyia curtipalpis,* sp. n., from Sarawak; *Uranotaenia macfarlanei,* sp. n., from Hong Kong; *U. moultoni,* sp. n., from Sarawak; *Rachionotomyia vicina,* sp. n., from Sarawak.

Stanton (A. T.). **The Anopheles of Malaya.—Part II.**—*Bull. Entom. Research, London,* v, pt. 2, September 1914, pp. 129–132.

A detailed account of the life-history of *Anopheles kochi,* Dön., from the egg to the adult is given [see this *Review,* Ser. B, i, pp. 5 & 33].

Gough (Dr. L. H.). **Preliminary Notes on Egyptian Mosquitos.**—*Bull. Entom. Research, London,* v, pt. 2, September 1914, pp. 133–135.

A list of mosquitos recorded from Egypt is given, including:—*Anopheles pharoensis,* Theo., which breeds in fresh water, stagnant ponds and similar places, and was found associated with an outbreak of malaria at Meadi; *A. squamosus,* Theo., from Kafr El Dawar; *A. turkhudi,* List., which has a continuous range from Teneriffe and Spain, through Algiers, Egypt, Arabia, Cyprus, Baluchistan to India, and normally breeds in brackish, but sometimes in highly saline, water and is possibly a malaria-carrier, being abundant at Kharga Oasis, where malaria is prevalent; *A. culicifacies,* Giles, which ranges from Algeria, through Egypt, Cyprus and Palestine to India and Ceylon; *A. mauritianus,* Grp., from Alexandria and Damietta; *Stegomyia fasciata,* F., from Port Said, Cairo, Meadi, Fayoum, and Suez; *S. sugens,* Wied., from Nubia; *Ochlerotatus longisquamosus,* Theo., one specimen only from Siwa Oasis; *O. aegypti,* L., which is common and breeds in both brackish and fresh water; *Theobaldia spathipalpis,* Rond., chiefly found in winter; *Culex quasigelidus,* Theo., from Meadi, rare; *C.* (?) *invidiosus* or *guiarti,* Theo., which breeds in fresh water and is common; *C. theileri,* Theo., from Kharga Oasis, rare; *C. pallidocephalus,* Theo., common; *C. quasimodestus,* Theo.; *C. fatigans,* Wied., common, and *C. pipiens,* L., which is the commonest Culicine near Cairo.

Roper (R.). **An Account of some Anopheline Mosquitos found in British North Borneo, with Description of a New Species.**—*Bull. Entom. Research, London,* v, pt. 2, September 1914, pp. 137–147. 2 maps.

The area investigated was about 45 miles along the coast of Kimanis Bay, from Jesselton to Membakut, roughly between 115° and 116° E. long. and 5° and 6° N. lat., the distance from the coast varying between 6 and 9 miles. Much of the coast is swampy, with scattered hills of from 50–200 ft. high, and much of the jungle has been felled for rubber cultivation, the flat land being used for cultivating rice and occasionally sago. The malarial incidence and spleen rate of the natives on several rubber estates and in the villages was investigated. Many of these were in the immediate neighbourhood of large swamps. In one such case it was found that some coolie lines which had large trees growing around them ceased to be infested with malaria as soon as the trees were felled, although no drainage of the swamp was possible. It is thought that the large trees shielded the adult mosquitos, which the remaining short undergrowth failed to do, and this may also explain the fact that on rubber estates the malaria rate is low so long as the rubber trees are young, but increases as the trees get larger. Anopheline larvae, most commonly those of *A. kochi*, were found without exception where search was made, and further search would probably show the presence of malaria-carrying species. The spleen-rate of the coolies on an estate roughly corresponded with that of the neighbouring village, and the amount of malaria to the proximity of swamp-breeding, malaria-carrying mosquitos. As regards the Anophelines found, it is noteworthy that eight out of the ten species identified are found in a circumscribed area :—*A. brevipalpis*, sp. n., found in the hospital of one estate only ; *A. kochi*, Dön., the commonest Anopheline, but no malarial parasites were found in any specimens ; *A. barbirostris* and *Culex mimeticus* were often found breeding in the same pools with them, but when found alone, *A. kochi* larvae seemed to prefer small pools without vegetation, such as those made by the hoof-marks of cattle ; *A. maculatus*, Theo., found in a clear pool close to a stream ; *A. leucosphyrus*, Dön., all the specimens being gorged with blood where malaria was prevalent (this species seems to breed in clean or dirty water) ; *A. punctulatus*, Dön. ; *A. ludlowi*, Theo., one specimen being from a spot where malaria was present, though it was the only species observed ; *A. separatus*, Leic., not common ; *A. barbirostris*, Wulp, found in swamp water without scum ; *A. umbrosus*, Theo., a common Anopheline (of 130 specimens dissected, only one contained malarial sporozoites) ; *A. albotaeniatus*, Theo., no larvae of which were obtained.

NEWSTEAD (R.). **Notes on *Phlebotomus*, with Descriptions of New Species.**—*Bull. Entom. Research, London*, v, pt. 2, September 1914, pp. 179–192.

Four new species of *Phlebotomus* are described, viz. :—*P. ingrami*, from Ashanti ; *P. simillimus*, from Ashanti and Southern Nigeria ; *P. bedfordi*, from the Transvaal ; and *P. stantoni*, from the Federated Malay States. The specific characters of seven other species are discussed and illustrated.

Yellow Fever Reports : Sanitary Conditions in Vera Cruz.—*Yellow Fev. Bur. Bull., Liverpool*, iii, no. 3, 30th September 1914, pp. 178–179.

Since the streets of both Vera Cruz and Mérida have, for the most part, been paved with concrete or asphalt, Anophelines and malaria have practically disappeared from both towns, and it appears that *Stegomyia fasciata* also has been got rid of in Vera Cruz, though in

Mérida this mosquito, as well as *Culex fatigans,* is still very common. If this difference is confirmed during the rainy season, it is undoubtedly due to the existence in Vera Cruz of a pipe-borne water supply, the absence of which in Mérida makes it impossible to abolish the innumerable water tanks in which *S. fasciata* breeds and which it is exceedingly difficult to keep mosquito-proof. A high death rate still prevails in Vera Cruz and Mérida, but mosquito-borne diseases cannot be held responsible. A large number of deaths are still, however, returned as due to malaria, either owing to the introduction of cases from the interior or to incorrect diagnosis.

Yellow Fever Reports: Screening of ships.—*Yellow Fev. Bur. Bull., Liverpool,* iii, no. 3, 30th September 1914, pp. 179–183.

Engeland has stated that ordinary mosquito gauze is better than wire gauze for screening [see this *Review,* Ser. B, ii, pp. 1–2], but evidently an inferior quality of the latter was used. Melville-Davison found that gauze manufactured of oxidised phosphor-bronze stands the sea-air admirably, and this has since been confirmed. The mesh opening must also be considerably less than the 2 mm. maximum allowed by Engeland. In the Booth liners, brass rims are used, which fit closely into the port-holes and need not be removed in order to close the ports. The good results obtained on these ships have not been due to comparatively small danger of infection, for the system has been in force for five years, during which time numbers of cases of yellow fever have occurred in the towns of Pará and Manáos. For a steamer to go to San Antonio, the terminus of the new Madeira-Mamore Railway, and return without a certain number of cases of malaria was unknown, but the first ship to use the system made two voyages to San Antonio without a single case occurring. The crew were permanent servants of the company, and were kept under observation for some time subsequently without showing the slightest signs of malaria. There is no reason why as good or even better results should not be obtained by the screening of ships as those obtained on shore.

SEIDELIN (H.) & SUMMERS-CONNAL (S.). **Notes upon the Biology of** *Stegomyia fasciata.*—*Yellow Fev. Bur. Bull., Liverpool,* iii, no. 3, 30th September 1914, pp. 187–192.

Marchoux and Simond concluded that the young females of *S. fasciata,* when sucking blood for the first time, bite indiscriminately by day and also at night, but later only during the hours of twilight. This was the suggested explanation of the apparently contradictory observations that yellow fever is transmitted at night only, while the female *S. fasciata* bites at any time. As a result of experiment the authors confirm the latter statement, but think that the view that yellow fever is not transmitted during the day is probably incorrect.

In connection with other experimental work it was found that mosquito larvae reared in distilled water on sterilised food throve and developed into adults.

Froggatt (W. W. and J. L.). **Sugestions in regard to the Checking of Sheep Maggot Flies.**—*Agric. Gaz. N.S.W., Sydney*, xxv, no. 9, September 1914, pp. 753–755.

This is an account of one year's experiments, carried out under natural surroundings at the Government Sheep Fly Experiment Station. As the summer advanced, it was found that most of the flies congregated in sheltered areas, chiefly near water, while any dead stock and other carrion, in which the flies breed, were invariably found in the vicinity of the watering-places and sheep camps. It is clear that the flies which infest the live wool of sheep only breed in the first instance in decaying animal matter; therefore, all such matter must be destroyed, with the result that the numbers of the flies will be greatly reduced and their natural enemies more effectively assist in their control. Where a recently dead animal is found, and the flies are very plentiful, enormous numbers can be attracted and killed by half skinning the carcase and slashing the flesh, and then treating it with a solution of 1 lb. arsenic dissolved by boiling in 5 gallons of water. Within the second day, the action of the arsenic hardens the flesh and stops decomposition, but the carcase can be turned over and the under surface will act as a poison-bait for another day when so treated. The remains will not be blown after such treatment, if the carcase has been thoroughly soaked with the poison, nor will birds or animals be attracted to it, but it is best to burn it if fuel is available. All offal found infested with maggots should be burnt; the proper method is to turn the carcase over, make a fire where it has been resting, turn it back on to the firewood heap, and see that everything is consumed. The usual method adopted is to pile some brushwood against the back of the animal and set fire to it; a sheep may be incinerated sufficiently by this means, but not a horse or bullock. Numerous examples of animals thus partially burnt, which were found to shelter millions of maggots, protected beneath the burnt skin from every kind of bird, have been seen. One of the contributing causes to the enormous increase of the blow-fly pest—dead poisoned rabbits—no longer exists over a very large area.

When once the sheep are attacked, the maggots under the protection of the fleece can only be destroyed by shearing off the infested wool, and treating with some mixture to kill or drive out those exposed. This entails a great deal of labour and expense, besides the injury to the animal and the loss of wool. A long series of experiments conducted with a number of the most popular preparations for killing maggots in the wool, in spite of the claims put forward by the vendors, proved that they are not more than palliatives, and that the most effective damaged the wool. On an average, the wool on a sheep's back grows at the rate of ¼ inch per month, so that there is always unpoisoned wool open to infection on a sheep that has once been blown, and unless all offensive wool is removed or deodorised, the sheep is very likely to become reinfested.

Endeavours have been made to obtain some mixture or essential oil which will entice the flies away from the sheep to traps or poisoned baits, or induce them to oviposit on material treated with such attractive properties, where the maggots, when hatched, will die. Most of the experiments have so far been negative, but the authors think they are on the track of a solution of the difficulty. The possibility of inoculation to render sheep immune to attacks, and the statement that all sheep that become blown are in an unhealthy condition, have not been borne out by field observations. Perfectly healthy animals are liable to attack, if their wool be soiled or wet. In the first stages of primary infestation the pest is entirely confined to the wool, not even the skin being affected, but in the later stages of development of the maggots, and often in cases of re-infestation, they break through the skin, setting up intense irritation and inflammation. If the wool be deodorised, and the odour which attracts the flies dissipated, the danger of reinfestation is greatly lessened.

FROGGATT (W. W.). **Sheep Maggot Flies.**—*Agric. Gaz. N.S.W., Sydney,* xxv, no. 9, September 1914, pp. 756–758, 1 plate.

This paper briefly describes the most common sheep maggot flies.

Lucilia sericata, the English sheep fly, and the allied *L. caesar* have been long known in the coastal districts of New South Wales, and are almost cosmopolitan, but only during 1913 have they been found among the sheep in the western country. The fly is common in Sydney, and although it will blow meat placed outside, seldom enters the house in search of food, as does the common yellow blow-fly. It feeds on all kinds of decaying animal and vegetable matter, damaged fruit, offal and kitchen refuse, and congregates on plants and shrubs where aphids or scale-insects are secreting honeydew. This species, up to the present, is not common in live wool.

Calliphora rufifacies, the green and blue sheep maggot fly, is common all over the interior of Australia. Under natural conditions it deposits its eggs on dead animals, and on evil-smelling wool on living sheep. The maggots of this species are known as "hairy maggots." It is the commonest species throughout the year, but is most numerous during the summer months in the north and north-west.

Neocalliphora ochracea, the reddish-brown blow-fly, is somewhat rare and nothing is known of its life-history; it is found in the bush in the vicinity of Sydney.

The grey-striped fly, *Sarcophaga aurifrons*, belonging to the allied family SARCOPHAGIDAE, has on two occasions been found in soiled wool. The larvae are common in the summer months on dead sheep, etc., and pupate in the soil beneath the carcase.

Calliphora oceaniae, the smaller yellow house blow-fly, often enters houses, and in the early part of the winter is very abundant in the bush, where it oviposits on the soiled wool of sheep.

C. villosa, the golden-haired blow-fly, like the last species, with which it is often found in company, lays eggs in the winter, and living larvae in the summer months. In the winter and early summer, these flies attack sheep, and lay their eggs upon the soiled wool; the maggots feed upon the substances in the wool, and when full grown, fall out of the fleece on to the ground, where they pupate below the surface.

Lucilia tasmaniensis, the island sheep fly, though originally described from Tasmania, has a very wide range through Queensland, the Solomon Islands, and the New Hebrides. In the islands mentioned it has been found blowing wool on live sheep, so that it may acquire this habit at any time, particularly in Queensland, where it is frequently found. Nothing is known about its life-history, but in the islands it is common along the edge of the bush wherever any decaying vegetable or animal matter is exposed.

The English blow-fly, *Calliphora erythrocephala*, common in England and Europe, has been introduced into New Zealand and Australia, and is found in Sydney and its suburbs throughout the early summer months. This cosmopolitan species lays its eggs in meat, and is found in gardens on decaying fruit and other vegetable matter.

FROGGATT (W. W.) & McCARTHY (T.). **The Parasite of the Sheep-maggot Fly (*Nasonia brevicornis*): Notes and Observations in the Field and Laboratory.**—*Agric. Gaz. N.S.W., Sydney*, xxv, no. 9, September 1914, pp. 759–764.

In 1909, Girault and Saunders described *Nasonia brevicornis*, a minute Chalcid, nearly all of which were obtained from puparia of different Diptera collected near Urbana, Illinois. They were not, however, very successful in artificially spreading this parasite in the University grounds there. Information has been since received from Dr. L. O. Howard that *N. brevicornis* has been recorded from Chili, while in New South Wales and Queensland it is now a parasite of the sheep-maggot flies. Ten years ago, Mr. Froggatt, when visiting the west in connection with the spread of sheep-fly maggots, found that wherever there was any carrion, there were in addition to *Calliphora rufifacies*, numbers of the shining black fly, *Ophyra nigra*, and the two common blow-flies, *C. villosa* and *C. oceaniae*. The two latter at this date were known to "blow" soiled wool on otherwise healthy sheep, and although *C. rufifacies* was by far the commonest species, it had not then acquired the habit of blowing live wool, and was simply found in carrion and freshly flayed sheepskins.

In breeding experiments, all kinds of blow-fly maggots were used, but it was found that the parasites showed a preference for the smooth thin-skinned pupae of *C. villosa*, *C. oceaniae*, and *C. erythrocephala*, and only infested the stoutly-spined ones of *C. rufifacies* when the others were unobtainable. The very noticeable decrease of the common yellow blow-flies and *O. nigra* in the north-west during the summer months within a few years leads the authors to think that these parasites in the first instance attacked the pupae of flies producing smooth pupae, and have only recently turned their attention to the harder spiny pupa of the "hairy maggot" of *C. rufifacies*. Under natural conditions, the flies and the parasites will be fairly evenly balanced and it cannot be expected that the parasite will exterminate the fly, but it can be reasonably hoped that it will keep it in check whenever it becomes established. The parasite can be very easily bred in captivity, and if necessary, large quantities could be artificially reared and distributed to all parts of Australia at a very moderate cost. During January–March, 1914, some thousands of parasitised pupae were forwarded to sheep-owners in different parts of New South Wales. Parasitised pupae of *C. rufifacies* collected in November 1913, from the remains of a dead fly-blown animal, were placed in a glass jar and in about twenty-four hours the small Chalcids began to make their appearance in great numbers. They were then transferred to ordinary glass lamp-chimneys, and to prevent their becoming entangled in the cotton wool, the plugs were enclosed in a piece of linen. A narrow strip of cloth was placed inside at one end of the tube and kept moistened with a dilute solution of honey and water, which appears to be a good substitute for the nectar of flowers upon which they probably feed under natural conditions. Several pieces of meat were left exposed in the laboratory and were soon infested with the eggs or maggots of several flies, including *C. villosa*, *C. oceaniae*, *Lucilia sericata*, *Sarcophaga aurifrons* and other smaller species ; the maggots were allowed to develop and pupate. The life-history of the parasite being unknown, it was first attempted to parasitise the maggots, and although the parasites made several attempts to insert their ovipositors into their bodies, they were prevented from doing so by the constant wriggling of the maggots. Some fresh pupae were then placed within the tube, on which the parasites immediately began to lay their eggs. The method of ovipositing is described at length, as well as the egg and pupa. The eggs hatch in about three days, and the period of development of the larvae occupies about seven and the pupal stage about five days. The males generally appear a little before the females, and as soon as the latter emerge, copulation begins. From each parasitised pupa, both sexes may emerge, but females for the most part predominate ; it was noted, however, that in one brood the males were in such extraordinary preponderance that the progeny was necessarily much reduced. The results under laboratory conditions have been most successful, the present brood being the tenth generation from the original stock. Trouble has, however, been caused by batches of the fly pupae dying from time to time from some unknown factor, the pupa rotting and drying up within the puparium. It seems possible that this wholesale mortality of pupae may be due to the unnatural rolling and movement of them while being transferred from jar to jar. This may injure the pupae in a critical stage of their process of histolysis.

The number of eggs laid by a single female parasite at one puncture has not been determined. From single puparia with which one parasite had been placed in a tube and allowed to remain until death, varying numbers developed, due perhaps to the size of the pupa, the largest always containing the most parasites. In twelve puparia thus isolated, the parasites developing in each varied from 37 to 10, and as this number increases in a single *Calliphora* pupa, the adult parasites are correspondingly smaller. One female placed in a tube with fifteen puparia in three instances parasitised the whole, with the exception of two which had decayed. The number of broods in a year has yet to be determined, but between December and May, ten broods developed under artificial conditions, which, however, may be more favourable to the parasites, and the number of broods would probably be less in nature.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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Froggatt (W. W.). **Animal Parasites, with special reference to the Sheep Tick** (*Melophagus ovinus*) **and the Biting Sheep Louse** (*Trichodectes sphaerocephalus*)—*Agric. Gaz. N.S.W., Sydney*, xxv, no. 9, September 1914, pp. 765–770, 1 plate, 6 figs.

The biting sheep louse, *Trichodectes sphaerocephalus*, which is said to be spreading all over Australia and the sheep tick, *Melophagus ovinus*, which was introduced into New South Wales at a very early stage of the sheep industry, have been declared a disease under the Stock Diseases Act of New South Wales; the former is the more troublesome of the two. The Hippoboscid, *M. ovinus*, L., spends its whole life on the skin or among the wool of the sheep. Though doing no very serious damage, except when very numerous, these parasites cause a great deal of irritation to infested lambs and sheep. *Olfersia macleayi*, Leach, the wallaby louse fly, is very plentiful upon wallabies in most parts of Australia, and frequently infests the kangaroo dogs after they have run down and killed these marsupials.

The biting louse of the sheep, *T. sphaerocephalus*, Nitz., has now become cosmopolitan. In order to check it, dipping has been made compulsory in most of the Australian States, where it is a very serious pest. It lives in the wool, close to the skin, where it oviposits. *Haematopinus urius*, Nitz., the sucking hog louse, is a very common parasite upon pigs in New South Wales, and has a world-wide distribution. It is a somewhat active creature and creeps about among the bristles. Infested pigs can be easily relieved by spraying or washing with a carbolic, or oil wash, or an arsenical dip-spray, as is used for cattle ticks. Pigs that have plenty of dry dust in which they can roll are said soon to clean themselves. The short-nosed cattle louse, *Haematopinus eurysternus*, Nitz., the long-nosed cattle louse, *H. vituli*, Linn., and the horse louse, *H. asini*, Linn., which is the common louse of the horse and the ass, are not uncommon parasites of cattle in Australia, and when very numerous upon the skin cause loss of the hair. Cattle in good health are not much troubled and the parasites are easily removed by spraying or washing with benzol, carbolic, or kerosene emulsion spray.

Seidelin (H.). **An apparatus for fumigation with cresyl.**—*Yellow Fev. Bur. Bull., Liverpool*, iii, no. 3, 30th September 1914, pp. 209–213, 1 fig.

Bouet and Roubaud have recommended fumigation with cresyl as an efficient mosquito-killing measure, and state that cresol, the somewhat more purified product, is even better, though more costly. A dose of 5 grammes of cresyl per 40 cubic feet was found effective, and costs less than 1*d*. per 1,000 cubic feet, the sealing of minor apertures being unnecessary. The author confirms these statements, and, in his first experiments, found it possible to evaporate cresyl in an ordinary glass retort. Details of a successful experiment are given, the fumes from two retorts, containing 165 cubic centimetres of cresyl each, being used to fumigate a room of about 2,640 cubic feet, adjoining the one in which the retorts were placed, by means of tubes passing through holes drilled in the wall. The door and the windows were kept well closed, but not sealed, and a towel was hung over a ventilating space above the door. The experiment started at 8.40 a.m.; ten minutes later vapours began to pass into the room; by 9.40 the test mosquitos in a cage near the window were dead; by 11.40 no more vapours were seen to leave the retorts, and the burners being put out, the door was opened; it was quite possible to remain within the room in spite of the very disagreeable smell; the mosquitos in a cage on the floor and in another one near the ceiling were dead. When the windows were opened the odour decreased steadily, and it would have been quite possible to sleep in the room that night, especially with the windows open as is usual in the tropics. The quantities of cresyl recommended by Bouet and Roubaud were therefore quite sufficient, even when evaporation took place in retorts instead of in open containers, and even when doors and windows were opened immediately instead of being kept shut for several hours. A satisfactory method of evaporating the cresyl in a metal retort was finally obtained by almost continually working the pump in a very powerful petroleum burner. In using this apparatus, which is figured, white vapours were produced which filled the room. Though some modifications of a practical nature are necessary, this method should be suitable not only for large buildings, but also for ships.

GORGAS (Surg. Gen. W.C.). **Report on Malaria and Blackwater Fever in Southern Rhodesia.**—*Southern Med. Jl., Mobile, Ala.*, vii, no. 9, 1st September 1914, pp. 687–693, 1 plate.

In this report to the Administrator of Southern Rhodesia on malaria and blackwater fever, it is stated that it is quite possible to dwell in good health on the edge of a swamp or bank of a tropical stream, so long as it is recognised that very much greater care is necessary than if high ground away from the water is selected for the site of a house. The author is inclined to think that blackwater fever is a phase of malaria and that the settler may be protected against both diseases by the taking daily of prophylactic doses of quinine both by himself and his natives, combined with the careful mosquito-proofing of his dwelling house and the clearing and draining of the ground within two hundred yards of it.

BEAL (W. P. B.). **Report Vet. Dept. Government of the Gold Coast for 1913,** *Accra*, 21st September 1914, pp. 15–16. [Received 4th February 1915.]

Blood-smears from cattle killed at Kumasi, show *Piroplasma bigeminum* and also evidence of a mixed piroplasmosis. Trypanosomiasis is again responsible for the highest mortality among horses. Treatment has been practically the same as before [see this *Review*, Ser. B, i, p. 19; ii, p. 48]. The atoxyl injections are repeated on the sixth and seventh day after the first two injections, and not at the eighth or tenth day, because there is a critical period encountered every fifth to eighth day which is shown by a rise in temperature. In some horses it is every fifth day, in others the sixth, seventh or eighth, due either to individual idiosyncrasies, or to the strain of trypanosome concerned. A period of five days is therefore advisable before the next injections. The horses which are discharged as cured, may harbour trypanosomes in their blood stream.

Three species of TABANIDAE have been taken in the North West of Ashanti, viz:—*Tabanus besti*, Surc., *T. kingsleyi*, Ric., and *T. marmorosus*, Surc.

RICARDO (G.). **A new Species of *Tabanus* from India.**—*Ann. Mag. Nat. Hist., London*, xiv, no. 82, Oct. 1914, pp. 359–360.

A new species of *Tabanus*, *T. trichinopolis*, sp. n., represented by two males and two females, is recorded by the author from Trichinopoly.

CARPENTER (G. H.) & HEWITT (T. R.). **Some New Observations on the Life-History of Warble Flies.**—*Irish Naturalist, Dublin*, October 1914, pp. 214–221.

Recent observations on *Hypoderma bovis*, De Geer, and *H. lineatum* have established the long-disputed fact that young *Hypoderma* larvae enter their hosts through the skin close to the spot where the eggs have been laid. An account is given of earlier experiments on this subject, calves were allowed to graze, being so muzzled by day that they could not lick themselves; at night, they were tied up with their necks in "bales," and with broad aprons to prevent their touching their fore limbs with their tongues; the numbers of warbles found on these animals was compared with those on control calves. The results of such experiments performed between 1906 and 1911 were valueless, owing to experimental sources of error; similar but improved experiments in 1913 showed that muzzling did not protect the calves from warbles, indicating that the larvae are not licked into the animals' gullets. From 1913, direct observations on the mode of egg-laying and hatching have supplemented muzzling experiments, and have shown that the eggs of *H. bovis* are laid on the legs and more rarely on the flanks, apparently never on the back, being attached singly to a hair near its base; those of *H. lineatum* are laid in rows of seven or more, half-way up the hair. The eggs hatch while on the hairs, the newly-hatched larva being less than 1 mm. long, with sharp and powerful mouth-hooks and a strong spiny armature on the body segments. In the case of a cow bearing eggs of *H. lineatum*, the skin was seen to be perforated near the newly hatched eggs, and then covered with a watery discharge, which had hardened; microscopic examination showed that this contained a newly-hatched larva. When newly-hatched larvae of *H. bovis* were placed on a calf's shoulder, the larvae crawled down the hairs to the skin and were seen to burrow, they entered perpendicularly to the surface, cutting into the epidermis with their mouth-hooks. The eggs are laid chiefly on the hind limbs, just below the heel joint or hock; they are rarely laid on the belly, flanks, or breast, and never, under natural conditions, on the back; under normal conditions the eggs hatch in about four days.

EDMONDS (C. R.) & BEVAN (L. E. W.). **Some Notes on the Systematic Dipping of Stock.**—*Rhodesia Agric. Jl., Salisbury*, xi, no. 7, October 1914, pp. 988–1003, 1 diagram.

At present, there are some 424 dipping tanks in Southern Rhodesia, one of them being subscribed for by the natives themselves, and during the last session of the Legislative Council an Ordinance was promulgated [see this *Review*, Ser. B, ii, p. 203] making dipping compulsory, where such is the wish of the majority. Since the blue tick, *Boophilus decoloratus*, is the principal disseminator of redwater, its destruction will considerably reduce, if not entirely eliminate the disease. This has happened on Bulawayo commonage and several farms as the result of systematic dipping.

In the case of East Coast fever, the tick mainly concerned is the brown tick, *Rhipicephalus appendiculatus*, although other species, such as the red-legged tick, *R. evertsi*, and the black-pitted tick, *R. simus*, have also been incriminated. Unlike redwater, the East Coast fever parasite is not passed through the eggs of the adult tick which has imbibed infected blood and is therefore not transmitted by the larvae hatching from such eggs. The brown tick belongs to the class of interrupted feeders, larva, nymph and adult feeding on separate hosts. The parasite having been taken up by a larva is transmitted to a susceptible ox by the nymph, or, if by the nymph, is transmitted by the adult, which may remain as long as fourteen months without feeding. As the brown tick seeks different hosts in the larval, nymphal and adult stages, and may escape from either in as short a time as three days, fortnightly dipping does not avail against it. To eradicate East Coast fever, a system of short interval dipping must therefore be employed, whereby the animal is dipped at intervals of three or five days. As a result of experiment the "Laboratory Dip," also known as the "five-day dip," was evolved, and later on the composition was modified to form what was known as the "three-day dip." The respective formulae are :—Five-day dip, 5½ lb. soft soap, 2 gallons paraffin, 8½ lb. arsenite of soda (80 per cent. arsenic) and 400 gallons water ; three-day dip, 3 lb. soft soap, 1 gallon paraffin, 4 lb. arsenite of soda (80 per cent. arsenic), and 400 gallons water.

Biliary fever of the horse is conveyed by the bite of the red-legged tick, *R. evertsi*, which has also been accused of transmitting East Coast fever and spirochaetosis of cattle. The adult may deposit several thousand eggs, from which the larvae will emerge under favourable conditions in about a month. They can live as long as seven months without feeding, but having found a host, feed and remain on the same animal as a nymph and drop off after a fortnight. After a quiescent period of about twenty-four days, the adult emerges and is ready to attach itself to a second host—another example of "interrupted feeding." These ticks are generally met with in the ear and beneath the tail, and are found on cattle, sheep, horses, mules, donkeys, goats and many wild animals. The disease known as malignant jaundice or biliary fever of dogs is transmitted by the dog tick, *Haemaphysalis leachi*, which is also an interrupted feeder. If, however, the adult female feeds on an infected dog, the parasite passes through the egg stage but, although the larva and nymph do not transmit it, it is carried through them to the succeeding adult.

The danger of scalding in stock is avoided by gradually habituating an animal to increasing strengths of dip. Well-bred calves especially should first be dipped in a solution weaker than the three-day dip until their skin becomes resistant. Animals which have been hustled and are heated when passed through the dip are more liable to be scalded. It is best to arrange the dipping at an hour when the animal will dry as quickly as possible. It has been thought harmful to work trek oxen on the day of dipping, but so far as Rhodesia is concerned, this objection does not hold good. Some 3,000 head were dipped every month, but no ill effect was reported. It is a habit of the brown tick and the red-legged tick to make their way into the ears and to attach themselves to the eyelids, where they remain protected from the dip, as animals which are accustomed to being dipped learn to avoid the complete immersion of the head. Ticks under the root of the tail often escape owing to some animals keeping the tail compressed when being dipped; others in the tuft of the tail are also protected by the matting of the hair. If the best results are desired in combating East Coast fever these parts should receive special dressing in addition to the dipping [see this *Review*, Ser. B, ii, p. 163]. Both the blue and brown tick will attach themselves to equines, sheep, goats, and other animals, but in so doing largely lose their infectivity to cattle. Nevertheless, a farm on which ticks are few is better insured against disease and any system of dipping should, so far as possible, include all classes of stock on the farm. By systematic dipping, the cattle and other animals act as tick traps, collecting the ticks and conveying them to the dip to be destroyed. In one of Watkins-Pitchford's experiments, it was found that a badly infested area was cleansed of brown ticks in as short a period as three months. Ticks are most active and plentiful in the warm wet season. With the onset of the summer rains the seed ticks emerge from the eggs and eagerly seek a host for the purpose of feeding, and it is at that time that dipping should be most vigorously applied, for it must be remembered that any one female which arrives at the adult stage may deposit several thousand eggs, which will rapidly hatch during the favourable conditions of warmth and moisture prevailing at that time of the year. Before coming to the conclusion that the systematic dipping has succeeded in removing all the ticks from the property, it is wise to select some animals known to be especially susceptible to ticks and search in the ears and under the hair of the tuft of the tail. The value of veld burning in the eradication of ticks has been somewhat exaggerated, for when the grass is dry enough to burn, the ticks are generally in the egg stage and safely hidden pending the arrival of more favourable conditions. Old dusty kraals provide warmth, moisture and a supply of suitable food for ticks. Infection has often been found to originate in the kraal and has only been eradicated after vacating it and burning or otherwise treating the manure in it. Apart from the actual transmission of specific diseases, ticks are responsible for considerable losses simply by reason of their presence on cattle. The arsenical poisoning of stock is referred to [see this *Review*, Ser. B, ii, p. 157] and the best antidote, both for absorbed or swallowed arsenic, is prepared by diluting 3 oz. of solution of tincture of perchloride of iron with 4 oz. of water; by dissolving 1 oz. of washing soda (carbonate of soda) in $\frac{1}{2}$ pint of water, and by mixing the two solutions. Three doses should be given at intervals of a quarter of an hour. In addition, demulcent drinks should be given, such as oatmeal gruel or a large quantity of linseed gruel. Animals that are scalded may be dressed with carron oil (a mixture of lime-water and linseed oil), or with an ointment made up of oxide of zinc with vaseline or lard. A valuable coloured diagram accompanies this article showing the stages in the life-cycle of the blue, brown and red-legged ticks, the hosts to which they attach themselves, and the diseases transmitted in the different stages.

GOMILEVSKY (V.). **Къ вопросу о борьбѣ съ мухами.** [The question of controlling flies.]—**« Прогрессивное Садоводство и Огородничество.»** [*Progressive Fruit-Growing and Market-Gardening*], *Petrograd*, no. 38, 4th October 1914, pp. 1175–1176.

Two compositions are recommended against house-flies :—(1) Five parts by weight of crushed pepper in pods, 5 parts of quassia powder, 10 parts of castor sugar, to which 10 parts of spirit is added ; the whole is carefully ground in a mortar and, when filtered, put on plates as a bait ; (2) two parts per weight of sweet rush-root [*Andropogon*, which yields oil of citronella], 15 parts of starch and 1 part of eucalyptol, all ground into a fine powder, and scattered over the spots frequented by flies. The smoke from dried water-melon leaves is also said to kill flies.

SACHAROV (N. L.). **Нѣсколько словъ о марганцево-кисломъ кали.** [Some words on potassium permanganate.]—**« Бюллетень о вредителяхъ Сельскаго Хозяйства и мѣрахъ борьбы съ ними,** [*Bulletin on pests of Agriculture and methods of fighting them*], Published by the Entomological and Phytopathological Bureau of the Zemstvo of the govt. of Charkov, *Charkov*, no. 5, October 1914, pp. 2–3.

In view of the possible shortage of imported insecticides owing to the war, experiments on the larvae of flies, especially on those of *Stomoxys calcitrans*, with potassium permanganate, are suggested A trial made with this agent some years ago against the larvae of *Stomoxys calcitrans* was not conclusive, but no flies were noticed during two years on an estate where this remedy was freely used in the stables, cattle-yards, and on dung heaps.

The Warble-Flies : Fourth report on experiments and observations as to life-history and treatment.—*Jl. Dept. Agric. Tech. Instruct. Ireland, Dublin*, xv, no. 1, October 1914, pp. 105–132, 4 figs., 2 diagrams.

i. CARPENTER (G. H.), HEWITT (T. R.) & KERRY REDDIN (T.). **New facts in the life-history.**

The observations and experiments made at Ballyhaise, County Cavan, and Athenry, County Galway, from the summer of 1910 to that of 1914, are recorded, and the work of Gläser [see this *Review*, Ser. B, ii, p. 198] and Hadwen, who have in several particulars arrived at the same results, is referred to. In 1913, *Hypoderma bovis* were in a large majority, both species passing about eight weeks in the pupal stage. In 1914, no adults of *H. lineatum* emerged, although they developed in the puparia, but 25 *H. bovis* were successfully reared. The flies emerge very early on bright sunny mornings. Pairing only lasts for a few minutes. The fly lays its eggs almost exclusively on the legs of the host, not confining itself to any particular part, but showing a decided preference—at least as regards *H. bovis*—for the heel or hock joint of the hind legs. The fly was never seen to strike the calf on the back. It works very quickly, but only for a few minutes at a time. *H. lineatum* lays its eggs on the hairs in rows and must therefore cling on for a few minutes while laying them, but *H. bovis* lays its eggs singly and quickly, greatly exciting the animals. It is believed that the mere irritation caused by the fly touching the calf is enough to cause gadding and terror. The animals do not seem to mind many other flies, some of which are blood-sucking, such as species of *Haematopota.* Eggs were obtained by putting a captured fly "sleeved" in a wire gauze cage on a calf's back or side, 60 eggs on one occasion being laid in an hour. The eggs hatched on the fourth day and the first-stage larva is described. The aspect of this larva suggests that it could bore as readily through the skin as through the mucous membrane of the gullet, and that it does so penetrate the skin seems to be proved by the result of the muzzling experiments and of the observations recorded below. The results of the muzzling experiments indicate no protection from warbles for those calves which cannot lick themselves and confirm the opinion that the maggot usually enters the host's body through the skin. The tongue, far from aiding the parasite, rather inhibits its progress and fewer maggots are found in animals that can lick themselves. A clothing experiment showed that covering the back is no protection, but covering the legs seems to be effectual. The result of an experiment in feeding calves with eggs and maggots is strongly against the view that the parasite gains entrance to the host by the eggs being swallowed, though it is possible that the young maggots are. A few days after eggs have been laid, the skin may be seen to be perforated with minute holes from which flows a watery discharge. On squeezing the skin of the earliest "case" that could be obtained, some clear watery fluid exuded from the holes a smear of which was found to contain a newly-hatched maggot of *H. lineatum.* In an experiment at Ballyhaise, seven first-stage maggots were placed on a closely clipped patch on the shoulder of a calf. Immediately they were put on the hairs they crawled down them to the skin, directed their bodies perpendicularly to its surface and soon began to disappear slowly into the skin. Some of them were watched cutting into the epidermis with their mouth-hooks, and it took them about six hours to get beneath the surface. These and other observations confirm the belief that the maggot enters the animal's body through the skin and not through the mouth or gullet. It still remains, however, to be considered how the parasite finds its way to the animal's back, as the eggs are laid on the lower parts. It is also unknown where the larva assumes the second-stage form The sub-mucous coat of the gullet would appear to serve as a norma resting-place for the parasites on their way to the back. The maggots appear to wander to and fro along the gullet during the late autumn and winter, but their general trend is from the pharynx backwards. The most interesting observation in connection with the migration of second-stage maggots is their recognition just outside the muscular coat of the gullet, as if they had bored through from the subcutaneous coat. No maggots were found within the vertebral canal where they have been seen by many Continental observers. Second-stage maggots were, of course, found beneath the skin from January onwards, becoming replaced by third and fourth-stage larvae as the season advanced.

ii. Duncan (J. L.), Hewitt (T. R.) & Jardine (D. S.). **The destruction of warble maggots.**

The systematic destruction of warble-maggots, by squeezing out the mature individuals, has been continued. Some of the maggots escape and have been extracted from cows up to the middle of July in the last two years. In the previous Report of 1910, a smear consisting of Archangel tar and paraffin was recommended, but though largely efficient, the mixture has often a highly injurious action on the cattle, making the skin very sore and destroying the hair. A number of other applications have been tried and lists are given of substances found to be useless or only of slight efficiency. The following were found to kill from 20 to 60 per cent. of maggots on each animal:—Cod-liver oil (12 parts), gas or wood tar (8 parts), and nicotine (1 part) is a mixture which kills 20 per cent. By replacing the nicotine by carbon disulphide (2 parts), 30 per cent. were killed. A mixture of cod-liver oil (10 parts), Venetian turpentine (10 parts), and nicotine (1 part) killed 60 per cent., but damaged the hair. Linseed oil and resin paste (1 part) with paraffin (9 parts) had the same effect as the Archangel tar (3 parts) and paraffin (1 part) mixture already mentioned. The most hopeful result is the discovery that sulphur dioxide gas, applied under pressure individually to each warble for less than a minute, kills 93 per cent. of the maggots and causes no harm whatever to the cattle. When, however, the gas was liberated under an air-tight rubber cover, spread over the animal's back, very few maggots were killed by it.

Breinl (A.). **The Distribution and Spread of Diseases in the East.** [Abstract from one of the Stewart Lectures of the Univ. of Melbourne, 1913.]—*Jl. of Trop. Med. and Hyg., London,* 1st October 1914, pp. 293–296.

Filariasis and elephantiasis occur generally throughout the East, and the filariae of the different countries probably belong to one species, but it has lately been noted that the typical nightly presence and daily absence of the parasites from the peripheral blood is not common to all the larvae. *Microfilaria nocturna,* of China, is nocturnal, but the Philippine microfilaria, as well as those of some of the New Guinea natives, is non-periodic, though the nocturnal filaria also exists in New Guinea. The non-periodical filaria occurs in some of the Pacific Islands, such as Fiji, and as *Stegomyia pseudoscutellaris,* which is stated to be an intermediary host, is present in Eastern New Guinea, the distribution of non-periodical filaria may be coincident with that of this mosquito.

Nuttall (G. H. F.). **Penetration of *Ixodes* beneath the Skin.**—*Parasitology, London,* vii, no. 3, October 1914, pp. 258–259.

Cases where *I. ricinus* have been found beneath the skin of various animals are recorded. The first such case in Great Britain occurred in two foxes, four or five ticks occupying as many cysts beneath the ear and about the groin of the animals; two of them were found to be *I. ricinus* (♀) and *I. hexagonus* (nymph). When the mouth-parts of the ticks become implanted in the subcutaneous tissue, the puncture leads to oedema and the oedematous tissue rises and gradually envelops them, large ticks like *Amblyomma hebraeum* and *A. variegatum* being often found only partly embedded. There are no records of this occurring in IXODIDAE with short hypostomes.

MURRAY (C. H.). **Notes on the Anatomy of the Bed Bug** (*Acanthia lectularia*, **L.**).—*Parasitology, London*, vii, no. 3, October 1914, pp. 278–321, 2 pls., 40 figs.

This is a detailed account of the general anatomy and the circulatory, respiratory, nervous and reproductive systems of *Cimex lectularius*, which is said to have a marked sense of smell, probably due to the possession of a peculiar sense-organ.

WHITNEY (C. P.). **Descriptions of Four New Tabanidae, with remarks upon** *Chrysops cursim*.—*Canadian Entomologist, London, Ont.*, xlvi, no. 10, October 1914, pp. 343–346.

Four new TABANIDAE, all from Florida, are described, viz.:—*Tabanus birdiei*, *T. milleri*, *T. beatificus*, and *Chrysops ultimus*. In the recently published "Insects of Florida," by Prof. C. W. Johnson, two specimens of *T. birdiei*, captured in 1912, are recorded as *cymatophorus*, O.S., from which they are now treated as distinct. The differences between *C. cursim* and *C. pudicus*, O.S., considered by Williston to be synonymous, are also noted.

The Duck as a Preventer of Malaria and Yellow Fever.—*Lancet, London*, clxxxvii, no. 4758, 7th November 1914, p. 1102.

Dr. S. G. Dixon, Commissioner of Health of the Commonwealth of Pennsylvania, has recently pointed out that the duck is one of the greatest enemies of the mosquito, and therefore can play an important part in the prevention of malaria and yellow fever [see this *Review*, Ser. B, ii, p. 10.] Two dams were built near one another on a stream, so that they gave exactly similar breeding grounds for mosquitos. In one 20 mallard ducks were allowed to breed; the other was protected from water-fowl, but well stocked with goldfish. The former remained for several months entirely free from mosquitos, which swarmed in the other. Mallard ducks were then admitted to the latter and no pupae could be found after 24 hours, and only a few small larvae after 48 hours. It is claimed that the duck surpasses all other creatures in its capacity for devouring large numbers of the larvae and pupae of mosquitos.

CONVERSE (G. M.). **The Sanitation of Iquitos, Peru.**—*Public Health Reports, Washington, D.C.*, xxix, no. 46, 13th November 1914, pp. 3030–3040, 2 plates.

Iquitos, a Peruvian port for ocean-going vessels, 2,300 miles from the mouth of the Amazon river, has an average annual temperature of about 86° F., with a high humidity. The town has 12,754 inhabitants, mostly Indians, and instead of a sewer system there are 11 miles of open drains. The larvae of *Stegomyia fasciata* were found in all artificial containers of water, but not elsewhere. *Mansonia titillans* occurs in millions in the open-ditch sewers. *Culex pipiens* and *C. fatigans* are found in the marshes, in natural pools, and in the natural wells used for washing clothes. Neither larval nor adult *Anopheles* were met with, either in the town or within several miles of it. The first sanitary measures undertaken were those usual against yellow fever. Although in previous years yellow fever had always been epidemic, there has not been a single case for 18 months, since February 1913, and the general mortality rate has dropped from 49·52 in 1912 to 28·88 in 1913, although the population has increased.

LONG (J. D.). **Plague Eradication in California. Present Situation—The Disease apparently eradicated.**—*Public Health Reports, Washington, D.C.*, xxix, no. 47, 20th November 1914, pp. 3103–3107.

Plague was first reported in California about the year 1900 and occasional cases occurred to 1904. The total number of cases since then amount to 187, the last human case occurring in a mild form in May 1914. Between August 1907 and December 1908, 523 plague-infected rats were found in San Francisco and in Oakland. In August 1908, the discovery was made that plague existed among the ground squirrels and that 140,000 acres were thus infected. The contagious disease act was made applicable over the entire area, and since 1st July 1913, the squirrels over 3,100,000 acres have been reduced in numbers, the average infestation being now probably about 1 squirrel to 4 acres, or about one-fiftieth of what it formerly was. It is estimated that about 20,150,000 squirrels have been destroyed since 1st July 1913. In a subsequent paper entitled, "The economy of ground squirrel destruction" [*Public Health Reports*, xxix, no. 50, p. 3317] it is stated that 497 replies were received to a circular enquiry as to the economic benefits of squirrel destruction. The amount expended per person was about £15 on an area of 321,233 acres and the direct saving per person was about £42.

RICARDO (G.). **Notes on the Tabanidae of the Australian Region.**—*Ann. Mag. Nat. Hist., London*, xiv, no. 83, November 1914, pp. 387–397.

The following Australian TABANIDAE are described, the classification of groups being that used by the author in *Records of the Indian Museum*, iv, no. 6, 1911 : Group iv, *Tabanus nemotuberculatus*, sp. n., *T. nemopunctatus*, sp. n., Queensland ; Group vii, *T. cinerescens*, MacLeay, *T. transversus*, Walk., *T. reducens*, Walk., Macassar and Celebes, *T. similis*, Macq., Tasmania, *T. rufinotatus*, Big., *T. queenslandi*, sp. n., *T. strangmannii*, sp. n., *T. parvicallosus*, sp. n., *T. laticallosus*, sp. n., *T. duplonotatus*, sp. n., all from Queensland.

NICOLLE (C.), BLANC (G.) & CONSEIL (E.). **Quelques Points de l'Etude Experimentale de Typhus Exanthématique.** [Notes on the Experimental Study of Exanthematous Typhus.]—*C. R. Acad. Sci., Paris*, clix, no. 19, 9th November 1914, pp. 661–664.

Researches were undertaken at Tunis in 1914, in order to clear up debateable questions as to exanthematous typhus, especially as regards the period when lice fed on infectious blood become virulent. The method employed consisted in the inoculation of monkeys and guinea-pigs with infected, pounded lice, using from 10 to 100, generally 40 individuals, and pounding them at known intervals after their infection. Of the animals used, 8 were inoculated with lice from 1 to 7 days after infection, but none of these contracted typhus ; the remaining 5 were inoculated with lice 9 to 10 days after their infection, and all 5 contracted typhus, showing that lice are not infectious before the 8th day and that they are usually infectious on the 9th and 10th. Seven peritoneal inoculations were made with the excrement of infected lice with the same results. Two experiments, in which monkeys were inoculated with young individuals, the offspring of infected lice, failed to convey infection and there is therefore no proof of hereditary transmission. The coccobacilli associated with typhoid, described by Edm. Sergent, were found in the intestines of 5 per cent. of the lice.

Two experiments performed on monkeys with the filtrate of from 140 to 175 individuals crushed 9 or 10 days after infection only gave uncertain results. Twelve successive transmissions were made on guinea pigs and it is hoped it will be possible to maintain the virus in this animal since at the 10th transmission it showed the same virulence for the monkey as at the beginning.

HOWARD (C. W.). **Control of Flies in Rural Districts.**—*Office of State Entom., S. Anthony Park, Minn.*, Circular no. 33, 30th November 1914, 12 pp. 2 figs.

In this circular special attention is drawn to the necessity for destroying fly maggots and to the importance of paying greater attention to the prevention of breeding than to the mere destruction of the flies themselves. Fully 95 per cent. of house-flies breed in horse manure, and stable litter therefore requires careful attention. Modern research has shown that there is no necessity for stacking manure in heaps and allowing it to rot, but that all its valuable properties are equally available if it be spread at once upon the land, and if this plan is generally adopted an enormous diminution of breeding facilities will result. Unfortunately, in small towns and villages, storage must be to a certain extent adopted, and it is suggested that receptacles should be provided with a screen door which should, as far as possible, be kept closed. Experiments made on a manure heap, sprayed every week with a mixture of 4 lb. sodium arsenite and 4 quarts of molasses dissolved in 50 gallons of water, were remarkably successful in the reduction of the number of flies. The question as to how far the adults of *Lucilia sericata* can work their way through the soil is difficult to decide and the records vary greatly, from 6 inches of ordinary soil to 6 feet of loose sand. Twenty-five per cent. of adult house-flies were found to be capable of working their way to the surface through 12 inches of black sandy loam, and it would appear that the depth from which the flies can reach the surface may be as much as 3 feet in a suitable soil, but that if garbage containing maggots be buried under one foot of soil, so exposed that the rain will compact it, the risk of any flies reaching the surface is reduced to a minimum.

The burning of household garbage, particularly in villages, is strongly urged, and in Minnesota a village garbage incinerator is at work which is said to be very cheap and quite effective.

ARCHIBALD (R. G.). **A Preliminary Report on Some Further Investigations on Kala-Azar in the Sudan.**—*Jl. R. Army Med. Corps, London*, xxiii, no. 5, November 1914, pp. 479–495.

After a description of the results of some laboratory investigations on transmission, a number of facts against the theory that kala-azar is conveyed by biting insects, are detailed. In the Sudan, this disease is extremely uncommon among the female population, though the customs of the native women would certainly expose them more readily to the attacks of such biting insects as bed-bugs, fleas, lice and mosquitos, which are to be found in the dark huts which are usually occupied all day by the female element of the population. Their beds also are usually heavily infested with *C. lectularius.*

As a rule, only a single individual is attacked, the other members of the family occupying the same huts showing no signs of the disease. Such animals as dogs, cats, goats, sheep, hens and pigeons, which are also frequent occupants of these huts, have never been found infected. It is difficult to associate this fact with the theory that the disease is transmitted by a biting insect, particularly in view of the evidence brought forward by Marshall, who found that the parasite was present in the peripheral blood in 86·6 per cent. of kala-azar cases, and by Wenyon, who successfully cultivated the parasite from the peripheral blood.

Since the disease has been investigated in the Sudan, it has not been found in an epidemic form, which is contrary to what occurs in most diseases transmitted by biting insects.

In the course of experimental researches, there has been no evidence to show the existence or development of the *Leishmania* parasite in bed-bugs, lice, and fleas fed on cases of kala-azar in the Sudan, and attempts to transmit the disease to susceptible animals by means of previously fed bed-bugs and lice have failed. Marshall also obtained negative results in his transmission experiments with the dog flea, *Ctenocephalus canis.*

Although the experiments illustrating the destructive action of human blood serum on cultures of *Leishmania* were carried out in vitro, they appeared to furnish presumptive evidence against the possibility of the cultural forms of *Leishmania* living after entering the human host *via* the skin.

Attempts to infect a susceptible animal, the monkey, *Lasiopyga callitricha*, by vaccinating it with a heavily infected culture of *Leishmania* failed.

The successful results obtained by feeding two animals with infected material, afford ground for suspecting a similar mode of infection in man, possibly through drinking water. The disease is more common in villages near the rivers, though cases also occur in villages inland, in which the wells dry up in summer. If water-borne, the disease should be more prevalent in the endemic areas; possibly some lesion of the intestinal tract is necessary, in order that the infecting organism may find an entrance.

Portchinsky (I. A.). **Очеркъ распространенія въ Россіи важнѣйшихъ вредныхъ животныхъ въ 1913 году.** [A review of the spread of the chief injurious animal pests in Russia in 1913.]—Reprint from **«Ежегодникъ Департамента Земледѣлія за 1913 г.** [*Year-book of the Dept. of Agric. for 1913*], *Petrograd*, 1914, 14 pp., 4 figs.

Regarding insects injurious to animals and man, reference is made to the researches of the Bureau of Entomology on *Phormia regina*. The life-history of this fly has been studied and compared with that of related species, and this investigation will supplement the American work on this pest, published in 1913 [see this *Review*, Ser. B, ii, p. 16]. The possible spread of foot and mouth disease by flies is considered, and it is pointed out that, although there are no observations which would implicate the house-fly, *Wohlfahrtia magnifica* causes serious injury in connection with this disease. As soon as wounds occur between the hoofs of stock, maggots of this fly immediately appear in them and cause great suffering and serious lameness in the animals attacked. Attention is called to a report on this disease by N. L. Skaloznkov from the government of Tobolsk, where maggots collected from wounds all proved to be the larvae of *W. magnifica*. Another report by Dr. L. Kuznebnov from Petropavlovsk is referred to in which several instances of attacks by these flies on man are given, the sight of an eye being totally destroyed in one case.

Sergent (Edm.). **Première note sur les Phlébotomes algériens.** [A first note on Algerian species of *Phlebotomus*.]—*Bull. Soc. Path. Exot., Paris*, vii, nos 8–9, 11th November 1914, pp. 660–662.

The geographical distribution of the genus *Phlebotomus* in Algeria is given. At the coast, *Phlebotomus papatasii*, Scop., is the only species taken ; it is found in all coast towns, is more numerous in some years than others and is very common in July, August and September. On the high plateaux, from 2,400 to 3,000 feet, *P. papatasii*, *P. minutus* var. *africanus*, Newst., and *P. perniciosus*, Newst., occur. In 1914, these three species were taken in the department of Constantine in the following proportions : *P. papatasii*, 45 per cent., *P. perniciosus*, 30 per cent., *P. minutus africanus*, 25 per cent. They only appear in September, chiefly during the first three weeks of that month. In the desert of Oran, *P. papatasii* predominates, only one *P. minutus africanus* having been taken against 202 of the former species, whilst *P. perniciosus* has not yet been seen. In this locality, *P. papatasii* is in evidence from mid-May to the end of October. At Biskra, *P. papatasii*, *P. minutus africanus* and *P. perniciosus* all occur. The two former are represented in about equal numbers, whilst *P. perniciosus* is more rare. They are found in the hot season, especially in autumn.

Bouilliez (M.). **Exposé des travaux en cours au laboratoire de Fort Archambault.** [Brief report on the work in hand at the laboratory of Fort Archambault.]—*Bull. Soc. Path. Exot., Paris*, vii, nos. 8–9. 11th November 1914, pp. 685–694.

This report records some investigations, not yet complete, undertaken at Fort Archambault, which is about 9° N. Lat., on the Shari

River and somewhat to the north of the Belgian Congo, where sleeping sickness extends up to 7° N. Sleeping sickness is endemic in the Bahr Sara valley, but it is uncertain whether it is of the same type as in the Belgian Congo and in Ubangi. Up to the present, *Glossina palpalis* has not been found, only *G. morsitans* and *G. tachinoides* having been seen. Only horses and goats are to be found near Fort Archambault, though in the Chad region to the north, cattle, sheep, goats and horses are the chief sources of wealth. The only form of trypanosomiasis as yet found in horses in the district appears to be due to *Trypanosoma pecaudi*, though *T. cazalboui* has been observed in two donkeys.

KNAB (F.) & BUSCK (A.). **Mosquitoes and sewage disposal.**—*Amer. Jl. Trop. Dis. Prev. Med., New Orleans*, ii, no. 5, November 1914, pp. 333–338.

Culex pipiens, *C. quinquefasciatus* and certain other species of mosquitos multiply most rapidly in the presence of highly polluted water. In this paper, details are given of a striking case where modern contrivances for sewage disposal, designed to safeguard the health and comfort of the community, have brought about excessive multiplication of mosquitos. The system in question is based upon the employment of a limited amount of piping and a small water supply and aims at the bacterial reduction of the sewage. One method includes the use of screen wells, cesspits and disposal fields; the second culminates in a large Imhof tank; in the third the tank is roofed over, the cover being provided with manholes in which are placed ventholes, through which the mosquitos gain access to the sewage below. In the latter case, oil application is impossible because of a considerable current at the surface of the liquid contents; the application of a miscible larvicide would arrest the bacterial reduction process.

TAYLOR (F. H.). **Report of Entomological Department.**—*Australian Inst. Trop. Med., Townsville, Queensland, Half-Yrly. Rpt.*, 1st January–30th June 1914, pp. 11–13.

Anopheles (*Nyssorhynchus*) *annulipes*, Walk., *Stegomyia fasciata*, F., and *Culex fatigans*, Wied., are widely distributed throughout the Northern Territory; these species also occur in Queensland. *S. scutellaris*, Walk., has been discovered in Port Darwin, this being the first record of this species on the mainland of Australia. At Melville Island, a new species of *Stegomyia* has been taken. Four new species of mosquitos are included in a collection from Tasmania, where *A. annulipes* is also found, though it would appear to be comparatively rare. Two new species, *Ochlerotatus* (*Culicada*) *fergusoni* and *Culex biocellatus*, have been received from the Bureau of Microbiology, Sydney. *A. annulipes* and *C. fatigans* from Melbourne and a new species from Central Queensland, *Ochlerotatus* (*Culicada*) *victoriensis* are noted.

HINDLE (E.). **Flies and Disease: Blood Sucking Flies.**—Cambridge: At the Univ. Press, 1914, xvi + 398 pp., 88 figs., 8vo. Price 12*s.* 6*d.*

This volume, together with that published by Dr. Graham Smith in the same series [see this *Review*, Ser. B, ii, pp. 19 and 166] covers the whole field of the general title "Flies and Disease." A short introduction, dealing with the mode of transmission, direct and indirect, intermediate hosts, the conditions which affect transmission, the development of the parasite and the general modes of infection, is followed by chapters on the structure and classification of the Diptera, with a list of biting flies known to transmit various diseases. Each family is dealt with separately and the more important members described in detail. A description of the diseases follows that of the family of flies concerned in their transmission. At the end of each chapter a bibliography of the subject dealt with, is given, but it is stated that this is not to be regarded as by any means complete, but only calls attention to books likely to be of service to students. Nearly 100 species are listed as being connected with the transmission of disease. Edwards' classification of the CULICIDAE is given in detail and a table of 241 known species with their present classification, generic synonymy and notes on their habitat and connection with malaria. The book contains a quantity of condensed information and largely fulfils the Editor's intention of presenting the present available knowledge of this subject in a handy form.

TULLGREN (A.). **Våra anyltgäster inomhus och i ladugården bland insekter och spindeldjur.** [Our household parasites and enemies of our domestic animals amongst insects and arachnids.]—*Stockholm*, 1914, 297 pp., 180 figs.

No work has hitherto existed in the Swedish language which deals with these pests. The book therefore meets a great demand, and it includes not only all the noxious species, but also harmless ones which are often not recognised as such by the public.

Two short introductory chapters deal with the relation of insects to man in general. The various orders are dealt with, but especially the Coleoptera and Diptera. The description, biology and remedies are given for each insect, in many cases illustrated by original photographs.

FRANCAVIGLIA (M. C.). **Ancora sulla mjiasi auricolare.** [Further note on auricular myiasis.]—*Boll. Sedute Accad. Gioenia, Catania*, no. 31, May 1914, pp. 15–23.

Among the MUSCIDAE which may be parasitic in the human ear, in the larval stage, the following are mentioned: *Sarcophaga carnaria*, L., *Wohlfartia magnifica*, Schiner, *Chrysomyia* (*Lucilia*) *macellaria*, F., *Calliphora vomitoria*, L., and *Anthomyia pluvialis*, *L.* In Russia, particularly in the districts of Mohilew, Orscha and Gorki, the rural population is in the habit of sleeping in the open and has been reported to suffer from a severe myiasis, due to a fly variously recorded as *Sarcophaga wohlfarti*, Rond., *S. ruralis*, Meig., or

Sarcophila meigeni, Portsch. These are probably all synonyms of *W. magnifica*. *Chrysomyia macellaria*, in Central America and South America, is quite as harmful as *S. carnaria*, causing perforation of the tympanum and meningitis. *Lucilia nobilis* and *L. caesar* have also been incriminated. *Calliphora vomitoria* may cause death. Of the sub-family ANTHOMYINAE, the larvae of *Fannia* (*Anthomyia*) *scalaris*, Meig., *F. canicularis*, Meig., *F. incisurata*, Zett., and *Hydrotaea meteorica*, L., are chiefly associated with myiasis.

If the larvae are outside the tympanum they may be detached by an injection of chloroform vapour, by a few drops of water saturated with chloroform, by an emulsion of 5 per cent. carbon bisulphide or with benzine. The chloroform and the carbon bisulphide act immediately, benzine may take up to half an hour. When detached they may be removed either with forceps or with a solution of boric acid. If the tympanum has been perforated and the larvae are either in the middle or internal ear, they must be removed without delay.

FRANCAVIGLIA (M. C.). **Larva de *Oestrus ovis*, L., per la prima volta rinvenuta nell' orecchio umano.** [The larva of *Oestrus ovis*, L., found for the first time in the human ear.]—*Bull. Sedute Accad. Gioenia, Catania*, no. 31, May 1914, pp. 23–27.

The author reports what is believed to be the only authentic case of auricular myiasis in man caused by the larva of *Oestrus ovis*, L.

BYRD (H.). **Mosquitoes : Rôle of Certain Species in Prevention of Malaria.**—*New Orleans Med. & Surg. Jl., New Orleans*, lxvii, no. 1, July 1914, pp. 14–17.

The fact that the East Coast of Florida suffers more from mosquitos, and at the same time less from malaria than the interior parts of the State requires explanation. During the last ten years, the author has collected about thirty species of mosquitos in the State, the maximum at any one place being about eleven. Those species which transmit disease, are found all over the State, while the remainder, twenty or more in number, are confined to restricted areas. These latter include the salt-marsh breeders, *Culex taeniorhyncus* and *C. sollicitans*, which surpass all others in abundance and blood-thirstiness and are very numerous on the East Coast of Florida. This compels the inhabitants to screen their houses and otherwise protect themselves, and in this way they are protected against *Anopheles* as well. Malaria is quite prevalent in areas beyond the range of the salt-marsh breeders. Other things being equal, the prevalence of malaria in a given locality bears an inverse ratio to the abundance of salt-marsh mosquitos. This proposition has two important corollaries : (*a*) That in Florida at least, where nearly all cases of typhoid fever are the result of fly carriage, this disease is reduced in a marked degree by the prevalence of salt-marsh mosquitos—for protection against mosquitos gives partial protection against flies ; (*b*) where other species of mosquitos, which do not transmit malaria, prevail in such a manner as to compel efficient protective measures, the prevalence of malaria and of typhoid fever are accordingly reduced. In Lake County, *Culex perturbans* is at times a veritable pest and the district is so free from malaria that a widespread belief that malaria is not present where there are pines, has been produced.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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SERGENT (Edm.), FOLEY (H.) & VIALATTE (C.). **Sur des formes microbiennes abondantes dans le corps de poux infectés par le typhus exanthématique, et toujours absentes dans les poux témoins, non typhiques.** [On micro-organisms found plentifully in the bodies of lice infected with exanthematous typhus and always absent in control lice free from typhus.]—*C. R. Soc. Biol., Paris*, lxxvii, no. 21, 19th June 1914, pp. 101–103.

In the bodies of lice infected with exanthematous typhus, coccobacilli have been observed which have a strong resemblance to the bacteria found by investigators in the blood of patients and already noticed by Ricketts and Wilder in the bodies of infected lice. These coccobacilli only occur in lice which have infected healthy subjects with exanthematous tyhus and have never been observed in the course of thousands of dissections of non-infected lice. If not themselves the virus of exanthematous typhus, they may be the outward sign of the presence of the invisible infective agent.

RINGENBACH (J.) & GUYOMARC'H (—.). **La filariose dans les régions de la nouvelle frontière Congo-Cameroun. Observations sur la transmission de *Microfilaria diurna* et de *Microfilaria perstans*.** [Filariasis in the areas along the new Congo-Cameroon frontier. Observations on the transmission of *Microfilaria diurna* and *Microfilaria perstans*.]—*Bull. Soc. Path. Exot., Paris*, vii, no. 7, July 1914, pp. 619–626.

The authors say that anyone making frequent microscopical examination of the blood of the natives in French Equatorial Africa cannot fail to be struck by the frequency with which filaria embryos are found, and they deal with the distribution of *Microfilaria nocturna*, *M. diurna*, *M. perstans* and a fourth species, *Filaria volvulus*, described for the first time by Brumpt from the banks of the Welle, in which district 5 per cent. of the fishermen and travellers were attacked. According to Ouzilleau, every individual exhibiting symptoms of elephantiasis is without exception infested by *F. volvulus*. Infection by these four varieties of *Filaria* is dependent upon biting insects, as has been demonstrated for *F. bancroftii* and *Culex fatigans*, and *Glossina* has been accused of carrying *Filaria volvulus*. In the Gaboon and on the middle Congo, *Chrysops centurionis*, Aust., called "Oseun" by the Pahouins and exceedingly common in the rainy season, persistently attacks man. Dissections of the stomachs of *C. centurionis* by the authors yielded *M. diurna* and *M. perstans* and they consider that the probability of this fly being the carrier is very great, though they were not in a position to prove it experimentally. Leiper's discovery that *Filaria loa* is carried by a species of *Chrysops* is quoted in support of their contention. A small midge of the genus *Ceratopogon*, known as "furu," which is exceedingly active at sunrise and sunset, never yielded *Microfilaria* either in its salivary glands or its stomach.

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Schwellengrebel (N. H.). **Versuche und Beobachtungen über die Biologie von *Xenopsylla cheopis* in Ost-Java.** [Experiments and Observations on the Biology of *Xenopsylla cheopis* in East Java.] —*Centralbl. Bakt., Parasit. und Infektionskr., Jena,* 1te Abt. Orig., lxxiv, nos. 5–6, 16th July 1914, pp. 456–466.

Xenopsylla cheopis not being a very mobile species, individuals from plague-stricken rats are only likely to reach human beings living in the same house. The various stages of this flea are considerably influenced by the hygroscopic condition of the surroundings and are also susceptible to changes in temperature. In Surabaya other as yet unknown factors unfavourably influence the development of this flea. In damp surroundings *X. cheopis* is better able to resist hunger than in dry ones, and this is probably one of the reasons why Surabaya has suffered so little from plague. Cajuput oil has proved a useful insectifuge against these fleas in Java. To destroy them on a small scale, carbon bisulphide or steam at 60° C. are recommended ; sulphurous acid is only useful on a large scale. The paper concludes with a bibliography of five works.

Schwellengrebel (N. H.) & Otten (L.). **Experimentelle Beiträge zur Kenntnis der Uebertragung der Pest durch Flöhe und Läuse.** [Experimental contributions to the knowledge of plague transmission through fleas and lice.]—*Centralbl. Bakt., Parasit. und Infektionskr., Jena,* 1te Abt. Orig., lxxiv, no. 7, 25th July 1914, pp. 592–603.

In Java, as in British India, *Xenopsylla cheopis* is able to transmit plague from one animal to another. Once it has sucked infected blood it is capable of transmitting plague by its bite for a period extending up to 33 days. Climatic variations only influence this power to a slight extent. Transmission is not purely mechanical, and is only really successful when the plague bacilli have increased in the intestine of the flea [*cf.* this *Review*, Ser. B, ii, p. 60]. Transmission is not possible if the fleas are parasitised by Tyroglyphine mites (probably belonging to the genus *Anoetus*, Duj.) in the *Hypopus* stage. These larvae prevent the fleas from moving and sucking freely. *Pygiopsylla ahalae* is also able to transmit plague. The period of infectivity could not be ascertained *in vivo*, but the bacilli were observed even after the fourteenth day. Plague bacilli were transmitted by *X. cheopis* and *P. ahalae* in circumstances excluding infection through their faeces, or any other way except through the proboscis. In nature, the louse (*Pediculus hominis*) also proved a virus carrier. Experiments have shown that up to now the immunity of house rats against plague is but little developed in East Java. Schwellengrebel states that in a recent paper [Centralbl. für Bakt, etc., Abt. I., Ref. lxi., p. 33] Galli-Valerio criticises his findings as follows : " On 56,790 people of the infected district of Malang, Schwellengrebel has only found three *X. cheopis* and on 1829 persons of the infected houses only seven *X. cheopis*. Under such circumstances how is it possible to ascribe to rat-fleas an important rôle in the transmission of plague to man ? " Schwellengrebel replies to this objection by pointing out that man is only a temporary host on which the flea does not remain after feeding. The fact that the rat-flea is only very seldom found on man does not militate against the hypothesis that it acts as the carrier of plague.

Craig (Capt. C. F.). **The prophylaxis of malaria with special reference to the military service.**—*War Dept., Office of the Surgeon-General, Washington, D.C.*, Bull. no. 6, (Aug. 1914), 115 pp., 12 pls. 1 chart. [Received 23rd December 1914.]

In this bulletin special stress is laid upon those measures that are most applicable in the prophylaxis of malaria in the military service, including service in the field, as well as in semi-permanent camps and permanent posts. The earlier chapters treat of the malarial parasites, malaria-conveying mosquitos, the prophylactic methods based upon the destruction of mosquitos, the protection of man from their bites, and the destruction of the malaria parasites (quinine prophylaxis). A bibliography of 70 works down to 1913 concludes this bulletin, in which all the knowledge on the subject is gathered and presented in a handy form.

Coates (G. M.). **A Case of Myiasis aurium accompanying the Radical Mastoid Operation.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxiii, no. 6, 8th August 1914, pp. 479–480.

On the third day after the radical mastoid operation had been performed on a boy of 14, when the packing was removed, from 40 to 50 small maggots came away with the gauze. The patient had spent the summer on a farm in New Jersey. The larvae are believed to have been those of the Texas screw-worm fly, *Chrysomyia* (*Lucilia* or *Compsomyia*) *macellaria*, which often deposits its larvae in open wounds or even in the nostrils of sleeping persons. In the present case the patient probably became infected before the operation.

Chapin (R. M.). **Arsenical cattle dips: Methods of preparation and directions for use.**—*U.S. Dept Agric., Washington, D.C.*, Farmers' Bull. no. 603, 14th August 1914, 16 pp., 1 fig. [Received 1st March 1915.]

As a handbook for users of arsenical cattle-dips, this bulletin supplies general information, formulae, tables and practical hints on the preparation and management of these dips. Changes in the composition and strength of the solutions have been dealt with in a previous paper [see this *Review*, Ser. B, ii, p. 145], but notes on the substances employed in making up the solutions are given here. The boiled dip is used in two strengths. The low-strength bath is commonly used for ordinary tick-eradication, the cattle being dipped regularly every two weeks for several months, if necessary. To make 500 U.S. gallons (416 Impl.) of low-strength bath take: Washing soda, 24 lb. (or monohydrated sodium carbonate, 10½ lb.); white arsenic, 99 per cent. pure, in fine powder, 8 lb.; pine tar, 1 U.S. gallon (0·83 Impl.). Put 25 U.S. gallons (20·82 Impl.) in a tank of about 45 gallons capacity, heat to boiling and add the washing soda. When this has dissolved add the arsenic, then boil and stir for 15 minutes or longer, until the white arsenic has entirely disappeared. If intended for immediate use, cool to 140° F. (by the addition of cold water if desired), then pour in the fine tar in a thin stream while constantly and vigorously stirring the solution. Immediately empty the liquid into the dipping vat, which has already been three-fourths filled with water, and stir thoroughly. For a stock solution to be kept on hand and used when needed, add no tar, but, after the solution of arsenic and soda has become entirely cold, make it up to 25 U.S. gallons (20·82 Impl.), stir well, let it settle, and draw off into containers which can be well closed. This constitutes "low-strength boiled arsenic stock," and its use in a diluted dipping bath calls for a "tar stock" prepared by dissolving $\frac{3}{4}$ lb. of dry caustic soda or concentrated lye (or 1 lb. of dry caustic potash) in 1 U.S. quart of water, add 1 U.S. gallon of pine tar, and stir thoroughly with a wooden paddle until the mixture, which at first looks streaked and muddy, brightens to a uniform thick fluid somewhat resembling molasses. A teaspoonful dropped into water in a glass and thoroughly stirred should mix perfectly with the water. Globules of tar seen by looking at the glass from underneath and which cannot be blended with the water by repeated stirring, indicate that more caustic soda solution is needed, and this should be added, not more than a pint at a time, and with thorough stirring, until the desired effect is produced. If a glass-vessel for making the test is not at hand, a little of the mixture may be taken between the fingers, which should then be dipped in water and the tar rubbed off. It should leave the fingers perfectly clean after a little rubbing. If an oily coating remains, more caustic soda solution is needed. The tar stock should be kept in closed containers. High-strength boiled dip or stock is prepared in the same way as the low-strength, except that 25 lb. of washing soda and 10 pounds of arsenic are used for 500 U.S. gallons of high-strength bath. The "self-boiled" arsenical dip was devised in order to meet certain drawbacks to the boiled dip, namely: (1) The necessity for boiling large amounts of liquid and (2) the impossibility of preparing highly concentrated stock solutions. It has been so named owing to the fact that the heat necessary to prepare the dip is wholly derived from chemical action between the raw materials. It has been thoroughly tested in practical dipping in the field and differs from the boiled dip merely in the formulae and methods of preparation, the composition of the diluted dipping bath being practically the same in both cases. The S.-B. dip is prepared in two parts, which must not be mixed except in the diluted dipping bath: (1) arsenic stock, (2) tar stock. The tar stock is prepared as stated above. To prepare S.-B. arsenic stock the following materials are required: Caustic soda, at least 85 per cent. pure, dry, granulated, 4 lb. (or $5\frac{1}{2}$ lb. dry caustic potash of equal purity); white arsenic, 99 per cent. pure, in fine powder, 10 lb.; washing soda, crystals, 10 lb. (or $4\frac{1}{2}$ lb. of monohydrated sodium carbonate). In a 5-gallon kettle or metal pail, place the 4 lb. of caustic soda, add 1 U.S. gallon of cold water, and stir with a stick until the soda is practically all dissolved. Without delay begin adding the arsenic, in portions of a pound or two at a time, as fast as it can be dissolved without causing the solution to boil, stirring all the time. If the liquid begins to boil, stop stirring and let it cool slightly before adding more arsenic. The secret of success is to add the arsenic fast enough to keep the solution very hot—nearly, but not quite at the boiling point. The result should be a clear solution. If the liquid persistently remains muddy or milky, it may be because the operation has been conducted so fast that much water has been boiled out and sodium arsenite is beginning to crystallize, in which case another gallon of water should be added and the mixture stirred. If the solution does not then clear up, the caustic soda must have been of very low grade and the undissolved substance must be arsenic. To obtain complete solution, put the kettle over the fire, heat nearly, but not quite, to boiling and stir. As soon as the solution of arsenic is complete, dilute to about 4 U.S. gallons, add the washing soda, and stir until dissolved. After the solution has become cold, add water to make it exactly 5 U.S. gallons, mix well, let it settle, and draw it off into containers which can be tightly corked or otherwise closed. Tin containers must be occasionally inspected for leaks due to the action of the solution on the solder. The chemicals have no effect upon iron. The dilutions at which the various concentrated stocks will be used are as follows: 1 part of boiled arsenic stock, (either high or low strength) added to 19 parts of water; 1 part of S-B arsenic stock to 124 parts water (low-strength) or 99 parts water (high-strength); 1 part of tar stock to 300 parts of finished bath. As an aid in dealing with the problems of replenishing a bath and of correcting its strength, tables are given which simplify the calculations. Notes on the construction of dipping vats and on the safe disposal of waste arsenical baths complete this paper.

TAYLOR (F. H.). **Contributions to a Knowledge of Australian Culicidae. No. 1.**—*Proc. Linn. Soc. N.S.W., Sydney*, xxxix, no. 155, August–October 1914, pp. 454–468, 4 plates. [Received 26th Jan. 1915.]

Descriptions of the following Australian CULICIDAE are given:—*Anopheles* (*Pyretophorus*) *atratipes*, Skuse; *Anopheles* (*Myzorhynchus*) *barbirostris*, v.d. Wulp; *Anopheles* (*Nyssorhynchus*) *annulipes*, Walk., from South Australia and Solomon Islands; *Armigeres obturbans*, Walk.; *Mucidus alternans*, West.; *Stegomyia scutellaris*, Walk., being the first record of this species from the mainland of Australia; *S. fasciata*, F., and *S. pseudoscutellaris*, Theo., from Samarai Island, which latter is said to be a transmitter of Filaria; *S. hilli*, sp. n., from Melville Island; *Chaetocruiomyia sylvestris*, Theo., *Ochlerotatus* (*Scutomyia*) *notoscripta*, Skuse, and *Aedimorphus australis*, sp. n., all from Queensland and var. *darwini*, var. n., from N. Territory; *Macleaya tremula*, Theo., from Queensland; *Ochlerotatus* (*Culicada*) *fergusoni*, sp. n., from N.S.W.; *O. victoriensis*, sp. n., from Victoria; *O. australis*, Erich., *O. vittiger*, Skuse, and *O. flavifrons*, Skuse, from N.S.W.; *O. tasmaniensis*, Strick., and *O. vandema*, Strick., both from Tasmania; *Ochlerotatus* (*Culicelsa*) *vigilax*, Skuse, *O. alboannulata*, Macq., *Culex biocellatus*, sp. n., *C. fatigans*, Wied., *C. occidentalis*, Skuse, and *C. tigripes*, Grp., all from N.S.W.; *C. sitiens*, Wied., from Papua; *Caenocephalus concolor*, Tayl., from Tasmania; *Finlaya poicilia*, Theo., from Papua; *Skusea bancrofti*, sp. n., from Queensland; *Menolepsis* (?) *tasmaniensis*, sp. n., from Tasmania.

GRAYBILL (H. W.). **Repellents for protecting animals from the attacks of flies.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 131, 10th September 1914, 26 pp. [Received 16th February 1915.]

Various repellents employed in protecting domestic animals from biting flies and from flies with parasitic larvae, are described and experiments recorded. The repellent action of certain colours is mentioned: light-coloured animals suffer less from flies than dark-coloured ones. In 1911, Oehmann recommended potassium tellurate as an internal remedy for repelling flies, but in the same year Mayer failed to obtain results with this drug, and it is probable that internal remedies will never prove practicable in repelling flies. The powder remedies that have been employed are pyrethrum powder and tobacco powder. The former is prompt in action, but it is costly and its effect lasts only for about a day. Tobacco powder has less killing power, but is more satisfactory. Various oils, emulsions of oils, and mixtures of oils, are used. Crude petroleum, cottonseed oil, fish or train oil, and light coal-tar oil may be used pure. Jensen (1909) recommended the following for dairy cows: Common laundry soap 1 lb., water 4 U.S. gals. (3·33 Impl.), crude petroleum 1 U.S. gal. (0·83 Impl.), and 4 oz. powdered naphthalin. This mixture, which must be stirred well before use and should be applied once or twice a week with a brush, is said to protect cows for a week. Fish oil, rated as one of the best repellents, has been used alone and in combination with various other substances. Its protective action is said to last from two to six days, depending on the temperature and humidity. In 1903, Moore recommended the following mixture for use on dairy cows: Fish oil, 100 parts; oil of tar, 50 parts; crude carbolic acid, 1 part. This mixture cost about 3½d. per gallon and was applied with a small hand spray pump, one application being effective for two days. Bishopp's formula is said to be very useful [see this *Review*, Ser. B, i, p. 98]. Laurel oil is also an efficacious repellent. Mayer (1911) found that it gave protection for a period ranging from 2 to 12 days and that the irritating effect produced by the pure oil—unless applied lightly—may be overcome by combining it with linseed oil in the proportion of 1 to 10. The present author found that 10 per cent. of laurel oil in cottonseed oil was active for less than a day. The following results were obtained in experimental tests: A 10 per cent. mixture of crude carbolic acid (21·8 per cent. phenols) in cottonseed oil has a strong repellent action, but this lasts less than a day. Application must be made lightly with a brush, since a heavy application with a spray pump is likely to cause poisoning. These remarks apply equally to mixtures of 10, 20 and 50 per cent. of pine tar in cottonseed oil, and to 10 per cent. of oil of tar either in cottonseed oil or in Beaumont oil. Mixtures of 10 per cent. oil of citronella, oil of sassafras, or oil of camphor in cottonseed oil are powerful repellents, but they are active for less than a day. A heavy application of fish oil causes the hair to become sticky and fall out. A light application did not produce these results. A bibliography of 20 works is appended.

WHITAKER (Helen D.). **Lice and Mites.**—*Washington State Agric. Expt. Sta., Pullman*, Popular Bull. no. 74, October 1914, 7 pp. [Received 16th February 1915.]

This bulletin gives popular accounts of and remedies for *Dermanyssus gallinae* (the common chicken mite), *Cnemidocoptes mutans*, which causes scaly legs in fowls, and the common hen louse. Reference is made to the statement by the U.S. Bureau of Entomology that the pigeon-mite is a different species from the chicken-mite, and that pigeons are not responsible for the spread of the chicken pest.

Hodgson (E. C.). **Malaria in the New Province of Delhi.**—*Ind. Jl. Med. Research, Simla*, ii, no. 2, October 1914, pp. 405–415, 4 charts, 7 maps, 6 pls.

Twelve species of Anophelines are recorded from the flat dry country round Delhi, which, in the cold weather, appears to be a most improbable place for mosquito breeding. In August and September, however, it is covered with large sheets of shallow water in the midst of which coarse grass and crops are growing, and in some of these pools larvae, mainly of *A. culicifacies*, are so numerous as to make a black rim, a foot wide, visible as much as twenty or thirty yards away.

The species concerned are:—*Anopheles rossi*, the larvae of which were found in small numbers as early as the beginning of April, but only began to show a large increase in July, continuing in enormous numbers in October, and gradually dying out in November, though a few were still found even as late as December. Its breeding grounds were multitudinous both in the city and outside it, and during the monsoon, it far outnumbered all the other Anophelines. It was never found infected with malarial parasites and its relative frequency in the various areas bore no relation to the amount of malaria. Its favourite breeding grounds are small muddy pools near houses and shallow pools in the Bela.

A. culicifacies was found throughout the entire year, though its numbers were much increased during the monsoon and for some time after it. Its favourite breeding grounds were:—Shallow temporary pools on the Bela; slow-moving streams and pools in the bed of shallow watercourses, some of which only had water running in them when rain was actually falling; in the main Western Jumna Canal and its tributaries, especially when the flow of water had been cut off at the canal head and the water remaining in the canal was slowly moving along its weed-grown bed. The important point about the favourite breeding grounds of this species is that the water must be fresh, not too deep, and be changed slowly but regularly. This species was twice found infected with malarial parasites by Adie in 1911, and three times by the author in 1912.

The larvae of *A. stephensi* were never found in large numbers in any part of the district, but their universal distribution in wells, not only in the city but throughout the country-side, made their numbers considerable in the aggregate. During the monsoon, especially in September, larvae were sure to be found in three out of four wells. The method adopted for capturing the larvae in this position was a slight modification of that of Christophers. In the modified method, the hoop carrying the net was let down into the water not horizontally but at an angle. The greatest care was taken not to cause any splashing, because, as pointed out by Bently in Bombay, *A. stephensi* larvae are extremely active and can, when frightened, remain below the surface over fifteen minutes. Instead of pulling the net straight up from the spot at which it has sunk, the whole water surface is skimmed as far as possible and larvae captured at other parts of the surface than that disturbed by the lowering of the net. *A. stephensi* larvae were also found in fair numbers in the pools on the Bela. One very unusual breeding place for this mosquito was found in April 1913, viz., a slowly-moving shallow stream. In this position the larvae were numerous, several hundreds being bred out, although they had not been found in the creek during the monsoon. This mosquito was twice found by the author to be infected with malarial parasites during the monsoon.

The larvae of *A. fuliginosus* were found throughout the year, especially in the main canal and to a less extent in deep permanent weedy pools; they were found also in the Bela. This mosquito did not show any real increase relative to the other species during the fever season (July to middle of November), but towards the end of November its numbers increased enormously. It is essentially a cold weather mosquito, though present all the year round. It was never found infected with malaria parasites.

The remaining mosquitos were all common in the district, but their numbers were not considered sufficient to be of any importance with regard to the spread of malaria. They include:—*A. pulcherrimus*, *A. fowleri*, *A. listoni*, *A. turkhudi*, *A. barbirostris* (which seems to have largely disappeared with the clearing of the thick scrub jungle from the Bela in 1911), *A. sinensis* (*nigerrimus*), *A. maculipennis*, and *A. jamesii* (not found by the author, recorded by Colonel Adie in 1910).

The extraordinarily small numbers of adult Culicine mosquitos which were found during the fever season in villages, and even in the city, was remarkable. During the early spring there is an enormous increase in these mosquitos, commencing at the end of March, reaching its greatest height in April, and dying away in May. The rise in the prevalence of Anopheline mosquitos commences rather later in the year. This begins in April, is at its greatest height during the first fortnight in May, and dies away again in June. There is a second rise in the Anophelines to a much higher level than in the spring, when the rains break. The Culicines do not show this second rise, and in the author's opinion, the fall in the number of Anophelines during June is solely due to want of breeding grounds during May and the first half of June, owing to the drying up of all the pools. These seasonal variations have been noticed in many stations in the Punjab. Of Culicines, *C. fatigans* was present in enormous numbers in March. A fair number of *Mucidus scatophagoides* larvae, nymphs and adults was found in August and September.

Desvoidya obturbans was also noticed. Numbers of *Stegomyia* were present, especially in September, the commonest species being *S. scutellaris* and the next in order of frequency *S. fasciata*. They were found breeding in the usual places, pots, tins, cisterns, etc., and particularly in the cement syphon tubes of the smaller branches of the canal. They were also occasionally found in wells.

During the fever season, Anophelines outnumbered the Culicines by ten to one, but only four of the former can be regarded as important in spreading malaria, viz., *A. culifacies*, *A. stephensi*, *A. fuliginosus* and *A. rossi*. The seasonal prevalence of the last-named agrees exactly with that of malaria, but it has never been found carrying malarial parasites in nature. *A. fuliginosus* is probably not an important carrier. There is no relation between its prevalence and that of the disease and it is most abundant when malaria is dying out.

Of the larvae-destroying fish, four species are recorded as useful, viz.:—*Trichogaster fasciatus*, *Barbus phutanio*, *Nuria danrica* and *Ophiocephalus punctatus*. Of these, *Trichogaster* is the hardiest and most effective. Maps, plates and numerous statistical tables accompany this paper.

PERRY (Major E. L.). **Endemic Malaria of the Jeypore Hill Tracts of the Madras Presidency.**—*Ind. Jl. Med. Research, Calcutta*, ii, no. 2, October 1914, pp. 456–491, 1 map, 1 plate, 4 charts.

The area investigated is included in the district of Vizagapatam in the Madras Presidency and is situated on the East Coast of India about midway between the ports of Calcutta and Madras. A general description of this locality is given. In the residential portion of Vizagapatam, and near all the neighbouring villages, Anopheline larvae are common and the following species were bred out:—*A. culicifacies*, *A. fuliginosus*, *A. stephensi*, *A. maculipalpis*, *A. rossi* and *A. sinensis*. Inland, the hill tracts have a bad reputation for malaria of a severe type, and blackwater fever is common among both European and Indian immigrants. Jeypore town itself, surrounded by dense jungle, was regarded as so unhealthy that the headquarters of the district were removed to Koraput, on a plateau 1,000 feet higher and free from jungle, in the belief that it would be healthier. On the contrary, it proved to be far worse, Anophelines being very abundant there. Culicines were rare on this plateau, never reaching 3 per cent. of the total catch in any month. Anopheline larvae could be found in the early months of the year on the sides of streams and rice fields, but during the monsoon they were entirely absent, reappearing again in October when it ceased. At only one point on the upper plateau did the author ever see a permanent puddle, which was on a road. In November, this was always swarming with *A. rossi* and Culicine larvae. As *A. rossi* was excessively rare at the time, it was suspected that the females depositing the eggs had come in the vehicles from the plains, this mode of spread having already been suggested by Gill. A small fish, *Danio rerio*, about an inch long, is common all over the Jeypore country and lives in shoals in the streams and rice fields, and where it occurred, no larvae were ever found, though there is no actual proof of its larvicidal habits. The variation in total numbers of Anophelines on the 3,000 feet plateau throughout the year was not so remarkable as that of the proportion of different species to the whole. A chart is given showing that *A. culicifacies* and *A. rossi* attain their maximum during the rainy season, falling suddenly to a minimum in September, the latter actually disappearing during the dry season. *A. jeyporensis*, *A. listoni*, *A. maculipalpis*, *A. fuliginosus* and *A. theobaldi* have a minimum in the rainy, and a maximum in the dry season. The former group are pool or surface-water breeders, and the latter, stream breeders. Fresh water and a moist atmosphere appear to be far more necessary to the breeding of Anophelines than of Culicines; Anophelines were never found in stagnant water, dammed streams and pools, though Culicines were plentiful there. In the course of the investigation, the following species were met with, viz:—*Anopheles* (*Myzomyia*) *culicifacies*, Giles, *A. listoni*, Liston, *A. albirostris*, Theo., *A.* (*Pyretophorus*) *jeyporensis*, Theo., *A.* (*Nyssorhynchus*) *theobaldi*, Giles, *A. fuliginosus*, Giles, *A. jamesii*, Theo., *A. maculipalpis*, James and Liston, *A. karwari*, James, *A.* (*Pseudomyzomyia*) *rossi*, Giles, *A.* (*Nyssomyzomyia*) *tessellatus*, Theo., *A.* (*Neocellia*) *stephensi*, Liston, *A. fowleri*, Christoph., *A.* (*Myzorhynchus*) *barbirostris*, Van der Wulp, and *A. sinensis*, Wied.

The type of malaria most prevalent in the Jeypore Hill Tracts is quartan, and the author thinks that the species of Anopheline present is one of the factors concerned, the prevalence of quartan fever varying synchronously with the rise and fall in prevalence of the stream-breeding Anophelines. The splendid physique of the inhabitants of the Jeypore country, despite a spleen rate of 80 per cent. to 90 per cent. in childhood, and a parasite rate of 80 per cent. is remarked upon. The climate is deadly to Europeans, but the aborigines appear to be immune and tolerant in a high degree of the presence of the malaria parasite in the blood. Great difficulty was experienced in finding Anophelines containing zygotes and sporozoites; of 982 specimens examined, only four, and these all *A. listoni*, were found to be infected. Attention is drawn to the relatively high percentage of *A. listoni* in human habitations and their practical absence from cowsheds, etc.

CORNWALL (Major J. W.) & PATTON (Capt. W. S.). **Some Observations on the Salivary Secretion of the Commoner Blood-sucking Insects and Ticks.**—*Ind. Jl. Med. Research, Calcutta*, ii, no. 2, October 1914, pp. 569–593, 2 charts.

Experiments show that the salivary secretion of *Philaematomyia crassirostris* (*insignis*) contains a powerful anticoagulin; the malesecretion is weaker than that of the female, and less active in recently hatched individuals of both sexes. The mensenteron contains a powerful coagulin which is most active in flies from 20 to 44 hours after their first feed of blood. The salivary secretion of *Philaematomyia* does not produce any irritation when injected into the human skin. *Musca nebulo*, one of the house-flies, has neither an anticoagulin in its salivary glands nor a coagulin in its mesenteron; *M. convexifrons* has no anticoagulin in its salivary glands, but a moderately powerful coagulin in its mesenteron; *M. pattoni* has a weak anticoagulin in its salivary glands, and a powerful coagulin in its mid-gut. *Stomoxys calcitrans* and another undetermined species, both lack an anticoagulin in their salivary glands, but have a powerful coagulin in their mid guts. The salivary glands of *Tabanus albimedius* contain a powerful anticoagulin, as also do those of *Anopheles rossi* and *A. jamesi*, the secretion of the last two causing immediate agglutination of the red blood corpuscles.

The secretion from the cardiac and ovoid salivary glands of *Cimex hemiptera* (*rotundatus*) does not appear to contain an anticoagulin, but this may have been due to the escape of this fluid from the glands while dissecting them out. The mid-gut does not contain an anticoagulin or a coagulin. The ovoid salivary glands of *Conorhinus rubrofasciatus* contain a powerful anticoagulin, the cardiac glands on the other hand only a weak anticoagulin. No antibody was formed in the blood of a rabbit on which large numbers of *Conorhinus rubrofasciatus* had been fed for more than a year. The blood of a rabbit not so bitten contains some substance which has a distinct inhibitory action on the anticoagulin.

The emulsion made from the salivary glands of *Argas persicus* does not change colour on exposure to air, but when mixed with blood, the latter becomes of a cherry red colour. The emulsion from the salivary glands of recently fed (5 days) ticks only contains a feeble anticoagulin, but if a longer time (10 days) is allowed to elapse, it becomes much more powerful.

Small quantities of the emulsion of the salivary glands of *A. jamesi* and *A. rossi* injected into the human skin cause small hyperaemic patches, probably due to the blocking of capillaries by the agglutinated red corpuscles. The secretions from the ovoid salivary glands of the bed-bug and of *Conorhinus rubrofasciatus* probably cause the irritation following the bites of these insects.

The structure of the mouth-parts of the blood-sucking MUSCIDAE, especially of the haematophagous species of *Musca* and of *Philaematomyia*, has led to the hypothesis that they have evolved from a *Musca*-like ancestor, which receives strong support from a study of the secretions of the salivary glands and the mid-guts of these flies.

SHIPLEY (A. E.). **Insects and War.**—*Brit. Med. Jl., London*, nos. 2803–2811, 19th September—14th November 1914, pp. 497–599, 527–529, 568–569, 614–616, 662–664, 705–707, 750–752, 784–786, 830–831, 52 figs.

This is a series of articles on parasitic insects and arachnids, which are likely to cause discomfort or disease under field-service conditions, and the best and simplest methods of controlling them.

Lice are dealt with at some length and it is pointed out that *Pediculus capitis* is of less importance in war time than *P. hominis* (*vestimenti*). Certain heads of advice are given for the soldiers' benefit, the most important of which are :—To examine the body frequently for louse bites and to avoid sleeping in places in which lousy persons have previously slept. To avoid infestation, the clothing should be changed as frequently as possible, for lice, if without food for a week or less, usually die of starvation ; all infested clothing should be burnt, buried or immersed for some time in water ; the lice themselves may be killed by applying petrol, paraffin, turpentine or xylol ; if the head be infested, rubbing with benzine will kill them. As the lice generally congregate in seams and folds of clothing, this should be turned inside out and the seams exposed to heat or to a jet of steam from a kettle or boiler, or pressed with a hot flat-iron. Soldiers should be informed that lice have been shown to be the carriers of typhus and recurrent fever and should be warned against scratching the skin and thus bringing about infection.

Bed-bugs and fleas are described and the usual methods of ridding premises of them are given, and it is pointed out that the eggs of the flea are not laid on the host but in cracks and crevices in boards.

The damage done to biscuits by *Ephestia kühniella* and *Corcyra cephalonica* is explained and the results of Durrant and Beveridge's investigations are given at some length [see this *Review*, Ser. A, i, p. 292 ; ii, p. 235].

Two articles are devoted to flies and their relation to typhoid and diarrhoea, and the possible carriage of cholera germs by their agency is pointed out. Various species of *Chrysomyia*, *Lucilia*, *Sarcophaga* and *Calliphora* oviposit in neglected wounds and in natural cavities of the body. The trouble and annoyance caused by the harvest mite, *Leptus autumnalis*, the larval stage of a *Trombidium*, may have serious consequences. The itching and smarting prevents sleep and may result in skin troubles and in some cases a general eruption and high fever. *Pediculoides ventricosus* attacks labourers dealing with grain, the bite causing severe irritation, local swellings and fever. The itch mite, *Sarcoptes scabiei*, and its mode of life are described, and attention is drawn to the fact that the genus *Sarcoptes* attacks many domestic and other animals and is capable of transference to man. The following ticks are described : *Argas persicus*, *Argas reflexus*, *Ixodes ricinus*, *Ornithodorus moubata* and also the parasitic Chalcid, *Ixodiphagus caucurtei.*

SHIPLEY (A. E.). **Cockroaches.**—*Brit. Med. Jl.*, *London*, nos. 2815 & 2817, 12th & 26th December 1914, pp. 1007–1009 and 1097–1098, 7 figs.

The article deals with the following species of cockroaches : *Periplaneta orientalis*, *P. americana*, and *Phyllodromia germanica*, the first-named being the commonest. The sticky, malodorous fluid secreted by the abdominal glands of these insects and their habits of fouling food renders them very objectionable to man. Cargoes of cheese are recorded to have been destroyed and rendered unfit for food by cockroaches on ships. Morrell's investigations on cockroaches on board ship are referred to at length, and his conclusions given, viz., that by contamination with its faeces the common cockroach is liable to cause souring of milk, the infection of the tubercle bacillus, dissemination of pathogenic staphylococci and the conveyance from place to place of destructive moulds.

BACOT (A.), PETRIE (G. F.) & TODD (Capt. R. E.). **The fleas found on Rats and other Rodents, living in Association with Man, and trapped in the Towns, Villages and Nile boats of Upper Egyp .**—*Jl. of Hygiene, Cambridge*, xiv, no. 4, December 1914, pp. 498–508.

The collections of fleas described in this paper were made in 1912 and 1913 in localities extending from Cairo southwards to Komombo, 26 miles north of Assiut. *Xenopsylla cheopis* naturally makes up the greatest bulk of the collections, the percentage on land rodents varying from 90 to 100. The few exceptions to this general rule are afforded by such hosts as *Gerbillus pyramidum*, a specimen of which yielded a high percentage of *X. cleopatrae ;* a species of hedgehog which showed a distinct preponderance of *Ctenocephalus felis ;* a weasel carrying *Echidnophaga gallinacea ;* and *Acomys cahirinus*, from Cairo, which had a marked infestation of *X. chephrenis*. On hosts trapped in the Nile boats, the relative numbers of *X. cheopis* declined, their place being taken by *Leptopsylla musculi*, which in one instance occurred to the extent of 85 per cent. *Mus. norvegicus* is the dominant rodent on the Nile boats. There is, however, no evidence that *L. musculi* favours *M. norvegicus* rather than *M. rattus*, though the land conditions in Upper Egypt seem to be unfavourable to *L. musculi*, for some unexplained reason. *Ceratophyllus* is represented in these collections by three specimens of *fasciatus*, all taken from *M. norvegicus* trapped on Nile boats during the first half of the year. *Echidnophaga gallinacea* is rare, and *Pulex irritans* is scarce considering the conditions in which a large section of the human population live. A record of the sexes in fleas captured on rats and other rodents, as well as on man, was made. In the case of *X. cheopis*, the females exceeded the males by 7 per cent., the excess being 20·2 per cent. and 72·2 per cent. for *Pulex irritans* and *X. chephrenis* respectively. As over 8,000 specimens collected in different seasons and separate localities were examined, these figures seem to indicate that this disproportion is general and implies some variation in the habits of the sexes.

SMITH (A. J.) & RIVAS (D.). **Notes Upon Human Filariasis (*Filaria loa*, Guyot, and *Filaria bancrofti*, Cobbold).**—*Amer. Jl. Trop. Dis. & Prevent Med., New Orleans*, ii, no. 6, December 1914, pp. 361–377.

This paper concludes with a few observations regarding the bed-bug, *Cimex lectularius*, as a possible intermediate host of filaria. In July 1911, a number of bed-bugs were fed on two individuals infested with *Filaria bancrofti*. Examination of the stomach of one of the bugs immediately after feeding revealed a great number of filarial embryos. After the eighth day living microfilariae continued, but no growth or change of morphology was appreciable. The infested individuals were then killed and sectioned, but no development of the microfilariae was recognised. It is questionable whether larval development is possible in the bed-bug.

BALFOUR (A.). **Birds and Malaria.**—*Lancet, London*, clxxxvii, no. 4762, 5th December 1914, pp. 1326–1327.

It is pointed out that while Dr. Dixon's experiments [see this *Review*, Ser B, iii, p. 25] are suggestive, the employment of aquatic birds for the destruction of mosquitos is not new. According to Friedrichs, ducks, like fish, keep pools and ponds free from mosquito larvae (see *Trop. Dis. Bull.*, ii, no. 12, p. 654) ; Sambon mentioned the larvivorous properties of water fowl (*Jl. Trop. Med.*, 15th September 1902, p. 283) and has now furnished further references, including the use of birds for dealing with the imagines, one dating back to 1890 and the other somewhere between 1790 and 1812, when the Commune of Marsciano, Umbria, asked for a papal decree prohibiting the killing of nesting swallows for food because their destruction brought about insalubrity in the region, one reason being that the swallows feed on the small flying insects so troublesome and hurtful to man and beast.

ROBERTS (N.). **Cyanide Fumigation of Ships: Method used in New Orleans.**—*Public Health Reports, Washington, D.C.*, xxix, no. 50, 11th December 1914, pp. 3321–3325.

In the fumigation of ships at New Orleans against rats, two methods are used, by either of which 1 ounce of KCN is used for each 100 cubic feet with 1⅔ ounces (about 1 fluid ounce) of sulphuric acid, and 3 fluid ounces of water. The " crock " or " solid cyanide " method is similar to that used by citrus growers, the solid cyanide being dropped into the aqueous acid solution contained in a cheap glazed stoneware crock of 1 gallon capacity. It is adopted for small accessible compartments, such as living quarters and store rooms. It is not trustworthy for unit quantities of cyanide larger than about 3 lb.—sufficient for about 5,000 cubic feet of space—as then the operator must stay a considerable time putting cyanide into a large number of crocks and must then escape through the top of the compartment where the gas soon tends to concentrate. The "barrel" or "liquid cyanide" method is therefore used for the holds. It is carried out by diluting the acid with part of the water in a barrel which is then swung down to the lowest accessible point in the hold; the cyanide, previously dissolved in the remainder of the water, is then poured into the barrel from the deck by means of a pitcher and funnel through a long rubber hose. After the cyanide is all in, it is followed, after a few seconds or minutes, by a strong sodium carbonate solution, which expels part of the dissolved hydrocyanic acid from the waste and reduces the remaining acidity, thus economizing on the expensive cyanide and rendering the waste less poisonous, corrosive and troublesome.

GALLAGHER (G. H.). **The Transmission of *Trypanosoma brucei* of Nigeria by *Glossina tachinoides*, with some notes on *T. nigeriense*.** —*Jl. Trop. Med. & Hyg., London*, xvii, no. 24, 15th December 1914, pp. 372–375, 1 chart.

Glossina tachinoides is prevalent in the Eket district of Nigeria, while *G. palpalis* and *G. caliginea* come next in order of number. Two strains of trypanosomes, which were brought home for further identification and study, were found, a third strain, probably *T. nanum*, being lost. The first is a polymorphic trypanosome indistinguishable from the Zululand strain of *T. brucei* and very probably, if not actually, identical with it. It is probably to be found all over Nigeria. This trypanosome is carried in the natural state by *G. tachinoides*, as has been previously shown by Bouet and Roubaud, who regarded it as *T. pecaudi*. *T. brucei* (*T. ugandae*) and *T. pecaudi* are considered to be identical, though not naturally always transmitted by the same species of *Glossina*. It is suggested that an attempt should be made to test the occurrence of a trypanosome producing posterior-nuclear forms in the more fatal cases of human sleeping sickness by inoculating every human case into animals, as this may lead to the discovery that fatal cases put down as due to *T. gambiense* are really due to what is claimed to be *T. rhodesiense*. There is ground for belief that the second strain, *T. nigeriense*, Scott-Macfie, is not identical with *T. gambiense* and the need for further research on this parasite is indicated.

WAYSON (N. E.). **Plague and plague-like disease. A report on their transmission by *Stomoxys calcitrans* and *Musca domestica*.**—*Public Health Reports, Washington, D.C.*, xxix, no. 51, 18th December 1914, pp. 3390–3393.

Bacterium tularense, the cause of a plague-like disease in rodents, has been found by Wherry and Lamb to be transmissible to man. In investigating the possible rôle of *Stomoxys calcitrans* and *Musca* *domestica* in transmission, it is proved that the bites of the former are able to transmit it from an infected guinea pig to a healthy one, and if the two applications are made within the space of an hour, the animal will die in from five to nine days. Washings of the flies in normal salt solution and of flies slightly crushed, when injected subcutaneously, will produce similar results. House-flies allowed to crawl and feed on the infected viscera of an animal dead of this disease, and immediately transferred to a prepared conjunctiva, cause a severe purulent conjunctivitis after 48 hours, ending in the death of the animal. The faeces of house-flies similarly fed, suspended in salt solution and introduced into the conjunctiva, will produce like results.

HUBER (G. U.) & FLACK (F. L.). **An Unusual Case of Screw-Worms in the Nose and Nasal Accessory Sinuses.**—*Jl. Amer. Med. Assoc., Chicago*, lxiii, no. 26, 26th December 1914, pp. 2288–2289.

Seventy-two and, later, forty Texas screw-worms [*Chrysomyia macellaria*] were removed from the nose of a farmer who had a long-standing specific necrosis of the bones of the nose and accessory sinuses which undoubtedly attracted the parent fly and furnished favourable conditions for development of the larvae.

HUDSON (H. F.). ***Lucilia sericata*, Meigen, attacking a live calf.**—*Canadian Entomologist, London, Ont.*, xlvi, no. 12, December 1914, p. 416.

A sickly calf is recorded to have been seriously infested by the larvae of *Lucilia sericata*, Meig., a large number being discovered embedded in the flesh, especially round the anus and base of the tail.

PARKER (R. R.). **A new Sarcophagid Scavenger from Montana.**—*Canadian Entomologist, London, Ont.*, xlvi, no. 12, December 1914, pp. 417–423, 1 pl.

Sarcophaga cooleyi, sp. n., is described and figured. It was extensively bred from decomposing fish and was also captured in privies, and around garbage, especially if the latter contained fish. In one experiment, in which two hundred larvae were used to determine the length of the larval stages, no adult emerged, but numerous Chalcid parasites were raised from the pupae.

HIRST (S.). **On the Parasitic *Acari* found on the Species of Rodents frequenting Human Habitations in Egypt.**—*Bull. Entom. Research, London*, v, pt. 3, December 1914, pp. 215–229, 14 figs.

The following species are recorded:—*Dermanyssus muris*, Hirst, from Egypt, Arabia, India, Ceylon, generally on *Mus rattus*; *D. sanguineus*, sp. n., from Egypt, generally on *M. rattus*; *D. aeygptius*, from Egypt, on *M. rattus*, *M. norvegicus*, *Acomys cahirinus* and *Arvicanthis niloticus*; *Leiognathus bacoti*, Hirst, which readily attacks man, from Egypt, Abyssinia, Australia, S. America, on *M. rattus* and *M. norvegicus*; *Laelaps echidninus*, Berl., probably cosmopolitan; *Argus persicus*, Fischer, from Egypt, on *M. rattus*; *Ornithodorus erraticus*, Lucas, from Egypt, on *M. rattus* and *A. niloticus*; *Rhipicephalus* sp., from *M. rattus* and *A. cahirinus*.

King (H. H.). **Further Notes on the Bionomics of** *Tabanus ditaeniatus*, **Macq., and** *Tabanus taeniola*, **P. de B.**,—*Bull. Entom. Research, London*, v, pt. 3, December 1914, pp. 247–248, 1 plate.

Additional details of the life-cycle of these two flies are given, the pupa of *T. taeniola* and the egg-masses of *T. ditaeniatus* being described and figured.

Akin (C. V.). **An Epidemiological Study of a Plague Focus.**—*Public Health Reports, Washington, D.C.*, xxix, no. 52, 25th December 1914, pp. 3468–3471, 5 figs.

On the 25th September 1914, two plague-infected female rats (*Mus norvegicus*) were captured in New Orleans in a building used partly as a stable and partly as a junk warehouse. The premises were vacated, rat-proofed and fumigated with sulphur. They were then sprayed with a 2 per cent. solution of kerosene emulsion. About 6,000 poison baits were placed. In spite of the burning of 80 lb. of sulphur to not more than 4,200 cubic feet of space (giving 16 per cent. of sulphur dioxide gas), no rats were compelled to leave their hiding place beneath the wooden floor, owing to its imperviousness to the diffusion of gas. A nest of young rats was found when the floor was removed. In spite of the proximity of human beings no cases occurred, which is explained by the great number of rats affording convenient hosts for the fleas, human blood being less attractive at all times.

Muir (F.). **On the Original Habitat of** *Stomoxys calcitrans*.—*Jl. Econ. Entom., Concord*, vii, no. 6, December 1914, pp. 459–460.

The author differs from Professor C. T. Brues's views as to the distribution of *Stomoxys calcitrans*, [see this *Review*, Ser. B, ii, p. 8]; the species is more likely, in his opinion, to have arisen in the Indo-Ethopian than in the Palaearctic region. *S. calcitrans* seems to be less abundant in Africa than in many extra-tropical regions, which may be due to the presence of parasites more favoured by the climatic conditions in Africa than in temperate regions.

Aders (W. M.). **Trypanosomiasis.**—*Zanzibar Protectorate Med. & Sanit. Rept. for* 1913, p. 99. [Received 1st January 1915.]

Only sporadic cases of trypanosomiasis are met with in cattle in the Protectorate of Zanzibar. Tsetse have never been found on the islands and, up to the present, negative results have attended experiments undertaken to ascertain whether the commonest blood-sucking flies there, viz :—*Stomoxys calcitrans*, *S. nigra*, *Tabanus taeniola*, and *T. fraternus*, transmit the disease. The trypanosome concerned has been variously identified by Bruce as *Trypanosoma pecorum*, and by Laveran as *T. congolense*.

Aders (W. M.). **Entomology in relation to Veterinary Science.**—*Zanzibar Protectorate Med. & Sanit. Rept. for* 1913, pp. 83–84. [Received 1st January 1915.]

A noticeable feature of the distribution of ticks in Zanzibar lies in the fact that the local inland herds carry few ticks in comparison with the town ones; this may be due to the large number of animals imported from the Somali Benadir coast, which are always heavily infested. The Hippoboscid, *Lynchia maura*, Big., is common on domestic pigeons and the larvae of *Oestrus ovis* have been obtained from goats. The Nycteribiid, *Cyclopodia greeffi*, Karsch, is common on flying foxes (*Pteropus voeltzkowi*).

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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Public Health Report.—*Zanzibar Protectorate Med. & Sanit. Rept. for* 1913, pp. 19–72. [Received 1st January 1915.]

Rat plague appeared in the City of Zanzibar in June 1913, after having been in abeyance since March 1911. The infection was probably brought by an infected rat landed from a dhow from Mombasa. The number of rats destroyed in 6 years from 1909 to 1913 was about 280,000 and as the foetus count amounts to about 25,000 a year, the town had during this period been rid of between 400,000 and 500,000 rats. It is not thought worth while to continue the campaign, and it is therefore proposed to put into force in 1914 and to continue for 5 years the principle introduced by Rodier into Australia for the purpose of destroying rabbits, which is based on increasing the proportion of males.

In the section dealing with mosquito-borne diseases, a table showing the breeding places of the various mosquitos is given. *Stegomyia fasciata* was predominant, being roughly three times as abundant as all other Culicinae and six times as abundant all Anophelinae. The table clearly shows that *S. fasciata* breeds in practically any water-containing receptacles, but not in swamps; that *Culex* prefers drains and cess-pools, but can be found in most receptacles; whilst Anophelines generally keep to the swamps and are only occasionally found in tanks, cisterns and water-barrels. Nearly half the premises where mosquito larvae were found, were in the Indian quarters. When larvae are found on any premises, a sample of the water with the larvae is collected in a test-tube, labelled and brought back to the Health Office. The breeding place is shown to the householder who signs a book to that effect. The larvae are then hatched out from the sample for scientific purposes, but may also be useful in any subsequent legal proceedings, because the inspector can go into court and swear that he found this particular specimen on the premises of the accused. The treatment of swamps with kerosene, under present conditions, involves useless expenditure, as in no case are the swamps properly graded, and therefore every shower washes out the contents of the puddles and renders them habitable by another brood of mosquitos.

MAY 20 1915

Aders (W. M.). **Entomology in relation to Public Health and Medicine.**—*Zanzibar Protectorate Med. & Sanit. Rept. for* 1913, pp. 76–82. [Received 1st January 1915.]

The common Anopheline of Zanzibar town is *Anopheles costalis*, Lw.; together with *Culex fatigans* and *Stegomyia fasciata*, it is prevalent throughout the island of Zanzibar and the adjacent small islands. Amongst the mosquitos not previously recorded from the Protectorate, are *Anopheles funestus*, Giles; *Culex fatigans*, Wied.; *C. invidiosus*, Theo.; *C. guiarti*, Blanch.; *Mucidus mucidus*, Karsch; *Toxorhynchites brevipalpis*, Theo.; *Ochlerotatus irritans*, Theo.; *Mimomyia mimomyiaformis*, Newst., and *Eretmopodites chrysogaster*, Grah. During 1912, a consignment of fish, *Haplochilus playfairii*, arrived from the Seychelles. They proved to be voracious feeders on mosquito larvae and this was also the case with young mullet, *Mugil* sp., and sea perch, *Ambassis commersonji*, kept in aquaria. The two latter

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species were taken near the mouth of fresh-water streams and are unable to live in sluggish, or badly oxygenated water. Among aquatic insects inimical to mosquito larvae, dragon-fly larvae and Nepidae are abundant in all the swamps. Fewer complaints have been made of the *Ceratopogon* prevalent on Prison Island during the hot months, since the larger of certain pits containing rotting vegetation were filled up with sand. *Xenopsylla cheopis*, Roths., the flea which occurs on the three common town rats of Zanzibar, was also abundant on the bandicoot, *Mus bandicota*. *Cimex lectularius*, L., is only exceptionally met with in Zanzibar, but *C. hemiptera*, F. (*rotundatus*, Sign.) is to be found everywhere throughout the two islands and is, at times, a veritable scourge in the prisons. Fumigation with Clayton gas has given excellent results. Among the Tabanidae not previously recorded are :—*T. conspicuus*, Ric., *T. leucostomus*, Lw., *T. producticornis*, Aust., and *T. albipectus*, Big. *Ægophagamyia pungens*, Aust., is never found inland, but is common on the sea-shore at various points. Goat's blood is the favourite food of this species, which is not recorded as attacking man. *Adersia oestroides*, Aust., is similar in its habits and is often found near cattle. *Haematopota decora*, Walk., is the only known species of the genus from Zanzibar ; it occurs throughout the year in both islands and generally feeds on cattle. *Chrysops longicornis*, Macq., has the same distribution and also occurs throughout the year ; it readily attacks man, inflicting a painful wound near the ankles. A chart is given of the seasonal incidence of the common Tabanidae, showing that they appear in great numbers after the rains, *e.g.*, in May, June and October. Animals somewhat out of condition are especially singled out for attack by *Stomoxys calcitrans*, L. Zanzibar is remarkably free from market flies, but the following have been identified : *Pycnosoma putorium*, Wied., *P. marginale*, Wied., *P. albiceps*, Wied., and *Musca domestica*. *Ornithodorus moubata* and *Auchmeromyia luteola*, although common in British East Africa and German East Africa, are unknown in Zanzibar, nor have specimens been obtained of Simuliidae, or of blood-sucking species of Psychodidae.

Lalor (N. P. O'Gorman). **Investigation of Malaria in the District of Katha.**—Rangoon : Office of the Superintendent of Government Printing, Burma, September 1913, 18 pp., 2 pls., 2 maps, 1 chart.

In the neighbourhood of the town of Wuntho malaria is very prevalent and is associated with blackwater fever. In 16 villages the spleen rate varied between 15·28 to 85 per cent. The breeding of Anophelines is favoured by the presence of stagnant water, which is present all the year round in irrigation cuts or in the pools to which they give rise. The indigenous Anophelines include : *Anopheles* (*Myzorhynchus*) *barbirostris*, *A. sinensis* (*nigerrimus*), *Anopheles* (*Nyssorhynchus*) *fuliginosus*, *A. maculipalpis*, *A. kochi* (*Christophersia halli*), *Anopheles* (*Myzomyia*) *culicifacies*, *A. rossi*, *A. listoni* var. *alboapicalis* and *Anopheles* (*Neocellia*) *willmori*. *A. barbirostris* is by far the most numerous species ; *A. culicifacies* is prevalent from the end of February until June, *A. barbirostris* and *A. fuliginosus* from October to December, *A. rossi* in May, and *A. listoni* from the end of October to the end of May. A larvicide formula suggested by the author is:—Coal tar, 1 pint; turpentine, 1 pint; soft soap, 1 oz.; water, sufficient to make up to 2 gallons. This quantity is sufficient for the effective treatment of 300 gallons of water.

BERNIER Y LAN (—). **Como luchar contra los insectos que molestan á los animales.** [The control of insect pests of animals.]—*Gaceta Rural, Buenos Aires*, viii, no. 86, September 1914, p. 140. [Received 22nd February 1915.]

The following insectifuge for working animals is given:—Vinegar, 100 grammes; phenic acid, 2 grammes; tincture of aloes, 15 grammes. An alternate formula consists simply of a 2 per cent. tincture of aloes. For dipping small animals, the following insecticide may be used:—Sodium carbonate, 50 grammes; water, 1 litre; powder of *Delphinium staphisagria* (stavesacre), 10 grammes. An infusion of the powder should be prepared. For rubbing the animals, either a mixture of 1 part kerosene in 10 parts of ordinary oil or a decoction of 50 grammes of stavesacre diluted in 1 litre of water may be used. The operation should be repeated on the fifth and eighth days.

KIEFFER (J. J.). **Chironomides du Lac de Tibériade.** [Chironomids from Lake Tiberias.]—*Jl. Proc. Asiatic Soc. Bengal (N.S.)*, x, no. 9, 1914, pp. 369–372. [Reprint received 9th March 1915.]

The following new species collected on Lake Tiberias in Palestine in October 1912, by N. Annandale, Keeper of the Indian Museum at Calcutta, are described:—*Pelopia cygnus*, *Trichotanypus tiberiadis*, a troublesome bloodsucker at Tiberias [see this *Review*, Ser. B, ii, p. 100], *Polypedilum genesareth*, *P. tiberiadis*, *Tendipes bethsaidae*, and *T. galilaeus*.

HEADLEE (T. J.). **Fly Control.**—*Rept. New Jersey Agric. Expt. Sta., 1913, New Brunswick*, 1914, pp. 698–718.

Summarising this extensive report, which should be consulted in the original by those interested, the author says that the fly-control campaigns in the city of New Brunswick, and on the College general and dairy farms, have shown: (1) the need of co-operation between the fly-supressing agency and the managers of the premises on which a fly campaign is in progress; (2) the insufficiency of the Hodge and other fly traps as a complete control; (3) the impracticability of obtaining anything like a general adoption of the Hodge garbage-can trap and its ineffectiveness as a destroyer of the house-fly, the really serious carrier of infection; (4) the paramount importance of eliminating the fly-breeding places; (5) the usefulness of iron sulphate and carbon bisulphide as larvicides; (6) the effectiveness of sulphur as a destroyer of adult flies; and (7) the utility of even incomplete work on fly control.

HEADLEE (T. J.). **Report of the Mosquito Work for 1913.**—*Rept. New Jersey Agric. Expt. Sta., 1913, New Brunswick,* 1914, pp. 719–789, 2 plates.

Included in this report are detailed accounts of the salt-marsh mosquito work, ditch cleaning, etc., and several problems connected therewith are discussed; reports of the various county mosquito extermination commissions, appointed by law in 1912, are also appended. The report concludes with a brief account of the mosquitos reported during the year, including: *Ochlerotatus* (*Aedes*) *canadensis, O. cantator, O sollicitans, Taeniorhynchus* (*Coquillettidia*) *perturbans, Culex pipiens* and *C. salinarius.*

HERRICK (G. W.). **Insects Injurious to the Household and Annoying to Man.** New York: Macmillan & Co., 1914, 8vo., xvii + 470 pp., 152 figs., 8 pls. Price 7*s.* 6*d.*

The mere fact of the publication of such a book as this is evidence of the great and increasing interest now being taken in economic entomology and especially in that part of it which intimately concerns man himself. This book is not intended to be a treatise on the relation of insects to disease nor has any attempt been made to deal with all possible pests, but it has been written particularly for those seeking information regarding household pests and practical methods of controlling them. Technicalities have therefore been avoided, whilst every effort has been made to secure accuracy. The illustrations, though many of them would hardly satisfy the systematic entomologist, will serve their purpose. Under each pest, references are given to the principal American literature and to other more or less readily accessible books with a view to helping those in search of further information. A chapter on poisonous insects and Arachnids explains the nature and the effects of the bites of spiders, ticks, centipedes, etc., and of a number of insects and caterpillars, the handling of which may have more or less unpleasant consequences. The opportunity is taken to point out that a large number of supposed dangerous insects are either quite harmless or practically so. The last chapter deals with the use of gases against household insects, no less than 11 pages being devoted to the use of hydrocyanic acid. Though all necessary and proper warning is given of the deadly character of this gas and of the material from which it is produced, the author says that despite this "he does not believe that any careful, thoughtful person should be deterred from employing this method of controlling household pests." The recommendation of this insecticide in American works on Economic Entomology exhibits a remarkable faith in the existence of care and thought amongst persons devoid of the most elementary knowledge of laboratory manipulation.

The book is written in a simple and easy style, and should be the means of spreading useful and necessary knowledge amongst those for whom it is intended.

De Charmoy (D. d'E.). **Summary of Investigations on Insect Pests during the five months, July–November 1914.**—*Mauritius Dept. Agric., Div. Entom.*, 4th December 1914, 2 pp.

The following Ixodidae are given as the commonest species affecting domestic animals in Mauritius :—*Argas persicus* on fowls ; *Amblyomma variegatum* on deer, cattle, and goats ; *Rhipicephalus sanguineus* on cattle and dogs ; *R. evertsi* on cattle and goats ; *Boophilus* (*Margaropus*) *decoloratus* on cattle. The fowl flea, *Echidnophaga gallinacea*, is reported on poultry in the north of the island ; a thorough dressing of the head with kerosene and cocoa-nut oil is recommended against it. The ground should be frequently sprayed with clear water, or watered with kerosene and phenyl mixture (1 per cent.), to destroy the larvae which breed in rubbish and animal matter in dry, shaded spots.

Macfie (J. W. Scott) & Gallagher (G. H.). **Sleeping Sickness in the Eket District of Nigeria.**—*Ann. Trop. Med. & Parasit., Liverpool*, Ser. T. M., viii, no. 3, 15th December 1914, pp. 379-427, 16 figs., 5 pls., 1 map.

Though the Eket district of Southern Nigeria is a by no means inaccessible region, and has been for 25 years the scene of the activities of the Kwa Ibo Mission, the existence of sleeping sickness there was not suspected until eight years ago. The physical features of the area are described, game being said to be rare, as might be expected considering the density of the population. Biting flies are numerous, Tabanidae being abundant on the Kwa Ibo River and *Chrysops dimidiata* has been taken in several localities. Tsetse-flies are widely distributed, but rarely occur in large numbers. In November and December practically all the flies caught near Ikotobo were *G. tachinoides* ; only two specimens of *G. palpalis* were taken and a single example of *G. caliginea*. *G. tachinoides* is unquestionably the predominant species, and is particularly easy to obtain where pigs are found, and is often seen attacking them. It is considered somewhat remarkable that *G. tachinoides* should be so common in Eket, where the dense vegetation, the humidity of the atmosphere, and the heavy rainfall would appear to be more suitable for *G. palpalis* than for that species. In Eket, males appear to be much more affected by sleeping sickness than females, though the natives say that is is equally common in both sexes. The majority of the patients are children, which are carried by their mothers into cultivated areas where *G. tachinoides* is common. Infected adults include a number of palm-wine collectors who spend their time in the forest or thick bush. The authors think that the parasite concerned (*Trypanosoma nigeriense*) presents characters which justify its separation from *T. gambiense*. Trypanosomes were exceedingly rare in the blood and even in the gland juices of the patients examined, and it is suggested that it must be a very exceptional occurrence for tsetse-flies to be infected by feeding on these cases.

The rarity of *G. palpalis* in the parts of the Eket district most affected by sleeping sickness, makes it difficult to understand how so small a number of these insects can be responsible for so large a number of cases, especially in view of the absence of parasites from the peripheral blood. On the eastern side *G. palpalis* is more common, but there the disease is much less frequent. This species cannot, however, be excluded for, though rare, it has been found in every place which has been carefully searched. *G. tachinoides* is more abundant, and especially associated with the sleeping sickness areas. The French Commission was struck by many examples which they found of several members of one family living in the same hut being infected, while others in the same village were not attacked, and they therefore argue the existence of a supplementary night-biting carrier. Twenty-three bugs collected from the beds of sleeping sickness patients were fed on a guinea-pig for 18 days, at the end of which time only two remained alive. The guinea-pig remained perfectly healthy, and no trypanosomes were found in its blood after 43 days. This experiment is, however, not conclusive, as guinea-pigs are not highly susceptible to the human trypanosome. None of the domestic animals examined were found to harbour trypanosomes of the human type.

In an appendix Dr. J. W. Scott Macfie gives details of the examination of, and experiments with, 145 wild *G. tachinoides*, with the result that *T. pecaudi* (*T. ugandae*), *T. pecorum* (*T. congolense*), and *T. vivax* were found to be transmitted by *Glossina tachinoides*, and were isolated by feeding flies caught in the neighbourhood of Ikotobo on healthy animals.

In another appendix Mr. Eakin, of the Kwa Ibo Mission, brings evidence to show that sleeping sickness had long been known to the natives, who even attributed it to the bite of a fly. He also gives an account of various native customs in connection with the disease.

A bibliography is appended.

Macfie (J. W. Scott). **Notes on some Blood Parasites collected in Nigeria.**—*Ann. Trop. Med. Parasit., Liverpool,* Ser. T. M., viii, no. 3, 15th December 1914, pp. 439–464, 2 pls.

In the course of experiments with trypanosomes a number of tsetse flies were dissected at Ikotobo, and in the lower half of the gut of a female *Glossina tachinoides*, innumerable spirochaetes were found. This fly had been fed for some days on a clean guinea-pig, but no spirochaetes were ever found in its blood, nor did it develop spirochaetosis. Subsequent experiments, in which wild *G. tachinoides* were fed on fowls, proved negative.

Schwetz (Dr. J.). **Quelques observations préliminaires sur la Morphologie et la Biologie de la Larve, de la Nymphe et de l'Image de l'*Auchmeromyia luteola*, Fabr.** [Some preliminary observations, on the Morphology and Biology of the Larva, Nymph and Imago, of *Auchmeromyia luteola*.]—*Ann. Trop. Med. & Parasit. Liverpool*, Ser. T. M., viii, no. 3, 15th December 1914, pp. 497–507.

The author collected a large quantity of *A. luteola* at Kabinda and placed a certain number of them in flasks with a little sand. A few days later the larvae pupated and in 15 days several flies were obtained, and by repeating the process, 50 flies were reared in two months. The males appeared to exceed the females by two to one. Experiments showed that there was no difficulty in rearing the flies in the laboratory providing the darker coloured, large larvae, were used. The white ones, especially if small, rarely pupated. The larval period depends entirely upon food conditions and the frequency of the meal of blood, and varies from an unknown minimum up to several months. The larvae are capable of supporting a very long fast, one under observation living for more than two months without food. On the 16th November, a female, just captured, began to oviposit and on the 17th had laid 25 eggs and then died ; on the 18th one larva had already hatched. According to laboratory observations the pupal stage is between 8 and 15 days. It was observed that none of the pupae collected outside ever developed, and apparently they are exceedingly sensitive to handling or to the slightest injury. When the larvae are put into a flask containing sand they immediately bury themselves to a depth of about two inches, and once in the sand, they remain quiescent during the day, but as soon as night arrives they begin to move about. It is generally believed that these larvae only bite at night and that the heat of the animal body directs them to their food. Darkness, however, is not a necessary factor, as they remain active at night even when placed within the rays of a powerful lamp. Though the larvae of *Auchmeromyia* thus appear to be nocturnal in their habits, the author was assured by natives that they were just as liable to be bitten in the day-time as at night if they lay on the floor of their huts.

Consulterio avicola [Poultry Notes].—*Chacaras e Quintaes, S. Paulo,* x, no. 6, 15th December 1914, pp. 414–415.

The following recipes for insecticidal dressings for poultry are given : Kerosene 40 parts, carbolic acid 3 parts ; mix and either spray or rub on. Wood ashes and kerosene made into a paste and rubbed over the feathers, or more liquid, and sprinkled on the birds. Plaster of Paris 4½ lb., cresol ½ lb., gasoline ½ pint ; mix thoroughly till dry, reduce to fine powder and dust over the birds. Liver of sulphur 3 oz., tepid water 5 pints ; wash the birds in the solution and take care that they do not catch cold afterwards. A tablespoonful of hog's lard, a teaspoonful of kerosene and a few drops of carbolic acid ; rub the head lightly, the joints of the wings and the back of the ribs and hip joints. Tincture of *Cocculus indicus,* made by macerating the seeds in alcohol for 8 or 10 days ; to be painted on with a brush or feather, under the feathers, especially those of the head, and around joints. Common soap, sufficient to make a slimy mass with cold or tepid water, add 5 per cent. kerosene and crude carbolic acid enough to give a slightly dark colour ; paint attacked parts with a brush and repeat the operation in a couple of days. The most effective remedy of all is fumigation with burning sulphur ; great care should be taken that the fumes do not reach the birds' heads. [See this *Review,* Ser. B, ii, p. 30.]

Brumpt (E.). **Importance du cannibalisme et de la coprophagie chez les Réduvidés hématophages (*Rhodnius*, *Triatoma*) pour la conservation des Trypanosomes pathogènes en dehors de l'hôte vertébré.** [On the importance of cannibalism and coprophagy in blood-sucking Reduviids (*Rhodnius*, *Triatoma*) for the preservation of pathogenic Trypanosomes outside the vertebrate host.]—*Bull. Soc. Path. Exot.*, *Paris*, vii, no. 10, December 1914, pp. 702–705.

The search for reservoirs of virus in the case of parasitic diseases of man is very important and the study of the habits of the carriers of infection is exceedingly necessary ; for this reason the author thinks it desirable to point out that cannibalism and coprophagy exist among certain blood-sucking Reduviids. Cannibalism was first recorded in *Triatoma megista* by A. Machado, and the author has himself observed it in *T. infestans*, *T. megista*, *T. chagasi*, and in *Rhodnius prolixus*. Torres has frequently observed it in *T. sordida*. It is especially frequent amongst young larvae a few weeks old which have fed several times in the ordinary way upon vertebrates, and it would appear that this habit of sucking blood which has already been taken from an animal by members of their own kind diminishes with age. Generally a cannibal *Triatoma* sucks those of its own species which are already fully gorged with blood and frequently the individual so sucked is not troubled by the operation, but continues its meal on the vertebrate concerned. The author has never observed the death of a specimen bitten by a cannibal. He regards this cannibalism as an ancestral survival of the normal entomophagous habits of Reduviids, which still persist even amongst some of those which are blood-suckers, such as *T. sanguisuga*, which, according to Mitchell and Dallas, suck Lepidopterous larvae, while Lafont describes *Triatoma rubrofasciata* as sucking bed-bugs in Mauritius. Coprophagy, observed by the author in the genus *Rhodnius*, has been hitherto unknown amongst blood-sucking insects, and in the case of *R. prolixus* this habit is exceedingly pronounced. It is suggested that it is quite possible in this way for them to become infected by absorbing the dejecta of insects carrying the flagellates, and that these habits have converted non-pathogenic flagellates of non-blood-sucking insects into pathogenic flagellates of insects which live by sucking blood.

Some details are given of preliminary experiments which tend to show that it is possible to carry on the development of *Trypanosoma cruzi* from one bug to another.

Brumpt (E.). **Le Xenodiagnostic. Application au diagnostic de quelques infections parasitaires et en particulier à la Trypanosomose de Chagas.** [Xenodiagnosis. Application to diagnosis of certain parasitic infections and especially of the Trypanosomiasis of Chagas.]—*Bull. Soc. Path. Exot.*, *Paris*, vii, no. 10, December 1914, pp. 706–710.

It is suggested that freshly bred *Triatoma* should be allowed to bite suspected cases of Chagas' disease and that they should be examined subsequently for the trypanosome and used as cultivating chambers for the development of any trypanosome ingested. They can afterwards be dissected and their body contents examined and the existence or not of the disease in a given patient be determined accordingly.

SPREULL (J.). **East Coast Fever Inoculation in the Transkeian Territories, South Africa.**—*Jl. Comp. Path. & Therap., London,* xxvii, pt. 4, December 1914, pp. 299–304.

After a brief summary of the spread of East Coast fever in South Africa, especially as to its invasion of the Transkeian Territories and the measures undertaken against it there [see this *Review*, Ser. B, ii, p. 163], the following precautions, which are regarded as essential towards the production of a high percentage of successful immunisations, are given :—The cattle must be free from infection at the date of inoculation ; they should be inoculated on clean veldt (*i.e.*, uninfected pasturage) ; they should be kept on clean veldt for 14 days after inoculation. Vaccine animals should be carefully selected, and only those which are well advanced in the disease should be killed for this purpose ; such vaccines, though they transmit East Coast fever upon inoculation and frequently cause heavy loss, are more satisfactory than those taken from an animal in the earlier stages of the disease. The latter often fail to transmit infection, and later, when the herd is subjected to the tick test, a very heavy mortality ensues. When virulent vaccines are used, the cattle which survive transmitted East Coast fever are almost certain to resist the tick test satisfactorily. The vaccine should be injected within six hours of manufacture in winter, and within four hours in summer. It is advisable to mix together the vaccines of several animals so as to produce a medium with uniformly high powers of immunisation. After the fourteenth day the inoculated animals should be placed upon highly infected and tick-infested veldt ; they must not be dipped after this date and the pathogenic tick should be given every chance to attach itself.

Some notes on the percentages of immunisation, virulence of vaccines, inoculation accidents, and the best season for inoculation are given. Along the coast, where little dipping had been practised, where the grass is rank and ticks plentiful, a six weeks' tick test was found to be ample in summer. In higher areas, where the grass is short and ticks not so plentiful, the period was lengthened to eight weeks. During winter, even three months was not equally effective. The question of second inoculations is discussed and it is thought that a second vaccination is necessary where previously inoculated cattle fail to become properly tick tested.

Cattle which have undergone the inoculation successfully, and have passed through a satisfactorily severe tick test shortly thereafter, have maintained a very high degree of immunity under the present conditions in the Transkei ; that is to say, they have maintained their immunity for three years and over. Whether such cattle would do so if they were removed from the bites of pathogenic ticks for a period of two years or more, and then re-exposed to them is still doubtful. In conclusion, it is pointed out that since East Coast fever gained a footing in the Transkeian Territories it has caused the death of about 900,000 cattle, and its eradication, even under the most favourable circumstances, will not be effected for some years.

Williamson (M. J.). **A Description of the Cyanide Process for the Extermination of Bugs.**—*Jl. R. Army Med. Corps, London*, xxiii, no. 6, December 1914.

Experience with troops in South Africa showed that scrubbing with cresol solution, anointing with paraffin and fumigating with potassium permanganate are only partially successful for the destruction of bugs, fumigation with potassium cyanide being the only satisfactory method. For this purpose the quantities to be used for every 100 cubic feet of space are: potassium cyanide, 1 oz.; sulphuric acid, 1 oz.; and water 2 oz. The spaces to be fumigated must be air-tight. As generating vessels, ordinary paraffin tins should be placed in the centre of each room; the cyanide, of the requisite amount for each charge, should be placed in stout paper or linen bags and water measured out into the tins. At the last moment, the exit door of the room must be made air-tight and finally the acid must be added to the water and the cyanide added while the mixture is still hot and the room sealed up for at least 4 hours.

McClain (J. H.). **Eradication of the cattle tick necessary for profitable dairying.**—*U. S. Dept. Agric., Washington, D.C.*, Farmers' Bull. no. 639, 19th December 1914, 4 pp., 2 figs.

Even in so-called immune cattle, ticks irritate the skin and draw blood to the detriment of the milk or flesh. The need of some definite knowledge on this subject led the Department of Agriculture to conduct some experiments on the effect of ticks on milk production and body weights of dairy cattle. The main results obtained were as follows: (1) Cows carrying ticks did not hold up so well in milk as those kept free from ticks and did not increase their flow of milk when the feed was increased, as did the tick-free animals. (2) At the close of the experiments those lightly infested with ticks were producing 18·6 per cent. less milk than those free, practically 1½ pints less per cow per diem. (3) The heavily infested cows were producing 42·4 per cent. less milk than the free animals, or nearly one-half U.S. gallon less per head per diem. (4) During the experimental period of one of the tests, which included 20 cows, the heavily infested animals lost an average of 9·3 lb. in weight, while the tick-free animals gained an average of 44·2 lb., although both lots were fed alike. (5) Cows which had previously been infested with ticks and were supposed to be immune, suffered from tick fever and one cow died. Spraying caused a temporary falling off of 6·1 per cent. in milk, but in from three to five days the bad effects of the spraying disappeared. Likewise, the shock of dipping caused the animals to lose an average of 10·6 per cent. in milk for two days, but after several dippings they became less sensitive and only lost 1 per cent. after the last few dippings. These losses are very small compared with those due to tick infestation and it is far cheaper to take measures to destroy the ticks.

NICOLLE (C.) & BLANC (G.). **Etudes sur la fièvre récurrente poursuivies à l'Institut Pasteur de Tunis : Deuxième mémoire (1914).** [Studies on recurrent fever carried out at the Pasteur Institute, Tunis: Second memoir (1914).]—*Arch. Inst. Pasteur, Tunis*, ix, no. 2, 1st December 1914, pp. 69–83.

After detailing the result of their researches [see this *Review*, Ser. B, ii, p. 132], and giving a résumé of those of Sergent and Foley [see this *Review*, Ser. B, ii, p. 200], the authors point out that the exact agreement of the results of independent observers, gives them a special value. They sum up their own work as follows:—(1) As regards the presence in the louse of spirilla visible under the ultra-microscope, these experiments show the continued absence of spirilla from the second to the fifth day, their non-continuous presence from the sixth to the eighth day, and their continued presence from the tenth to the twelfth day. (2) As regards the virulence of lice for the monkey, it was found that it was absent from the second to the fourth day after the infecting meal, that it was present on the fifth and sixth days, and again absent from the eighth to the twelfth day. (3) If the results obtained in 1914, by the examination of lice under the ultra-microscope on the one hand and by using them to infect monkeys on the other, be compared, the following table is obtained: Second, third and fourth days after the infecting meal—no spirilla, no virulence; fifth day—no spirilla, virulence; sixth day—spirilla present exceptionally, constant virulence; eighth day—non-continuous presence of spirilla, no virulence; tenth and twelfth days—constant presence of spirilla, no virulence. Combining their own and Sergent and Foley's results, they arrive at the following conclusions: absence of spirilla and inconstant virulence on the second, third, fourth and fifth days from the infecting meal; absence of spirilla and constant virulence on the sixth day; inconstant presence of spirilla and, exceptionally, virulence on the eighth and ninth days. The general conclusion is that the virulence of infected lice has no relation to the presence in these insects of spirilla visible under the microscope or ultra-microscope. It is chiefly in its prespirillum phase —*i.e.*, at the moment when it is about to become visible—that the recurrent fever agent shows its highest virulence in the louse. At that moment the louse is most dangerous, but it may be dangerous at any time from that of the infecting meal up to the fifteenth day after the meal. The negative results obtained with monkeys are in no way definitive, as man alone provides an indisputable reaction as regards the virulence of the spirilla.

NICOLLE (C.), BLANC (G.) & CONSEIL (E.). **Nouvelles recherches expérimentales sur le typhus exanthématique pratiquées à l'Institut Pasteur de Tunis pendant l'année 1914.** [New experimental researches on exanthematous typhus carried out at the Pasteur Institute, Tunis, in 1914.]—*Arch. Inst. Pasteur, Tunis,* ix, no. 2, 1st December 1914, pp. 84–121.

The authors arrive at the following conclusions:—(1) Lice fed on infected monkeys, then crushed and inoculated into the peritoneal cavity of the monkey or guineapig, are virulent for these animals on the ninth and tenth days after the infecting meal and not before this. (2) The excreta of these same lice are infectious from the above time onwards. (3) Two attemps to reproduce typhus experimentally with the offspring of infected (and virulent) lice, proved negative. Heredity of infection is not a proven fact in the case of the louse and it does not appear probable. (4) Bacterial forms, identical with those described by Edm. Sergent and his collaborators from lice fed on typhus patients, have been found in a similar proportion in lice taken from the inhabitants of a non-infected country. (5) Two experiments on the filterability of the exanthematous virus contained in infected lice have given only uncertain or incomplete results. (6) The guineapig can almost completely replace the monkey in the study of exanthematous typhus ; it is suitable for the purpose of keeping the virus in the laboratory. (7) The spleen of infected animals is virulent, but not to a more marked degree than the blood. The association of heterogeneous serums with the exanthematous virus (blood) appears to diminish the resistance of the guineapig, but not in a manner useful for experiments. (8) A previous attack of spirillosis sometimes protects the monkey against the effect of a subsequent inoculation with exanthematous virus ; this resistance is perhaps nothing more than the effect of the recent inoculation of the blood elements. (9) Further attempts to reproduce exanthematous typhus in the rabbit, dog and cat proved negative.

Regulations of the Montana State Board of Entomology.—*1st Bienn. Rept., Montana State Bd. Entom., 1913–14, Helena*, December 1914, pp. 12–15. [Received 27th March 1915.]

The Montana State Board of Entomology has issued regulations in connection with the control of *Dermacentor venustus*, the carrier of Rocky Mountain spotted fever in the Bitter Root Valley. They provide for the division of the area into tick-control districts, for the erection of a dipping-vat and yards in each district, for a close quarantine of all domestic animals which are not dipped, and for the issue of permits without which no domestic animal (including cows, horses, asses, mules, sheep, goats, and hogs) may be removed from the districts in question.

King (W. V.). **Work of Bureau of Entomology against Spotted Fever Tick in co-operation with Board.**—*1st Bienn. Rept., Montana State Bd. Entom., 1913–14, Helena*, December 1914, pp. 16–27. [Received 27th March 1915.]

The U.S. Bureau of Entomology has established three control districts against *Dermacentor venustus* in the northern end of the Bitter Root Valley. The instruction of the public as to the part played by the tick was an early phase of the work. The control programme may be outlined as follows :—the destruction of adult ticks on domestic animals ; the destruction of native rodents ; the burning, clearing, and development of land ; the construction of dipping vats. Should the practical difficulties in destroying the ticks on domestic animals be overcome, it is still thought that this method, which was the one originally proposed, would effect control. The destruction of native rodents is an important secondary measure, and the success of this work in 1914 makes the author think it important to continue it on a larger scale in 1915. The cultivation of land is of the greatest importance in securing a permanent tick-free area, and the burning of uncleared land is the popular method, but as this practice tends to the neglect of other precautions, it is being combated by attempts to show its futility except as a preliminary measure. Three dipping vats have been installed and the "Laboratory Dip" recommended by Watkins-Pitchford in the Union of South Africa is used. Working horses, milk cows, and other animals are exempted from dipping in cases where the owner prefers to pick by hand. This is more effective than a general measure which could not be absolutely enforced, and it enables the relative importance of different groups of animals to be determined and control efforts can be concentrated accordingly.

FRICKS (L. D.). **A review of Rocky Mountain Spotted Fever eradicative work conducted by the United States Public Health Service in the Bitter Root Valley, Montana.**—*1st Bienn. Rept., Montana State Bd. Entom., 1913–14, Helena,* December 1914, pp. 28–31. [Received 27th March 1915.]

The information in this paper is covered by that given in a subsequent paper by the same author which is abstracted below [p. 62].

PARKER (R. R.). **Summary of "Report to the Montana State Board of Entomology concerning fly investigations conducted in the Yellowstone Valley during the summer of 1914."**—*1st Bienn. Rept. Montana State Bd. Entom., 1913–14, Helena,* December 1914, pp. 35–50. [Received 27th March 1915.]

This is a brief statement of breeding experiments in which a total of 13,353 flies were bred, representing 11 families and more than 40 species. So far as the house-fly was concerned, nearly all records were from horse manure. The total catch of flies during a period of eight weeks was 96,114, representing some 25 species; 88,245 were house-flies. The other species present in great abundance were *Muscina stabulans*, Fall., 3,473, *Lucilia sericata*, Meig., 1,456, and *Fannia* spp., 2,294, including *F. scalaris*, F., and *F. canicularis*, L. The families, SARCOPHAGIDAE, ORTALIDAE, CULICIDAE, and SAPROMYZIDAE are also represented. In observing the flight of flies, the individuals were marked by being allowed to feed on coloured syrup, the coloured contents of the abdomen identifying them when captured. Excluding CULICIDAE, at least 50 species of flies were found which bred in or frequented human excrement. The house-fly probably constituted 90 per cent. of the flies captured on garbage; of those captured in the "privy trap experiment," 8·94 per cent.; of those taken in the open with human excrement as a bait, 21·81 per cent. *Sarcophaga* (*Ravinia*) *communis*, Pkr., *S. peniculata*, Pkr., and *S. haemorrhoidalis*, Meig., were bred very abundantly from human excrement and the first two species also breed in horse, cow, and pig dung. Owing to the great attractiveness of beer for various species of excreta-frequenting flies, their presence in saloons may perhaps be of importance.

Flies of the genera *Leptocera* and *Scatopse* seem to be worthy of further investigation, as they both breed in human excrement and are found in houses. A species of *Scatopse* was noted on human foods, and water stored in carelessly covered barrels might well be infected by *Leptocera*, which are said to fly considerable distances for water. Other species which seemed of potential importance were *Muscina stabulans*, Fall., *Lucilia sericata*, Meig., *L. caesar*, L., *Phormia regina*, Meig., *Calliphora erythrocephala*, Meig., *C. coloradensis*, Hough, *C. latifrons*, Hough, *Fannia scalaris*, F., *F. canicularis*, L., *Drosophila ampelophila*, L., and *Piophila casei*, L.

FRICKS (L. D.). **Rocky Mountain Spotted Fever.**—*Public Health Reports, Washington, D.C.*, xxx, 15th January 1915, pp. 148–165, 3 sketch maps.

In continuation of the field investigations and attempted eradication of Rocky Mountain spotted fever, the author was again ordered to the Bitter Root Valley, Montana, in March 1914. The field work for the year consisted of laboratory investigations and measures for the control and eradication of the disease as well as the study of its distribution. The laboratory experiments will be made the subject of a separate report. Some control over the prevalence of the disease in the Bitter Root Valley must be exercised by the attitude of the inhabitants, who now generally avoid the woods and uncultivated lands of the infected territory during the tick season, or at least protect themselves against tick bites by proper clothing and occasional searching. The measures adopted against the wood tick, *Dermacentor andersoni*, comprise the reclamation of arable land, the burning over of the foothills, the killing of wild animals, hand picking and the dipping of domestic animals in arsenical dips, and sheep grazing. The placing of new land under cultivation is effected, as a rule, by means of small isolated fields surrounded by open, uncultivated land. As the full benefit from cultivation is not obtained except in the case of large tracts, and the western foot-hills are too broken for extensive continuous cultivation, it is not expected that this measure alone will greatly affect the problem of tick eradication. An extensive burning over of the foot-hills each spring should reduce tick infestation, but though the systematic attempt to do this was continued in 1914, no great success was attained, as the rains prevented extensive burning until the snow had disappeared, when this measure would have been dangerous to standing timber. The destruction of small wild animals appears to have aided in the considerable decrease of infestation in the Victor district. During 1914 the carbon-bisulphide pumps were used extensively for the destruction of ground squirrels. The full complement of three concrete dipping vats, placed from 8 to 10 miles apart in the southern half of the Bitter Root Valley near the infected territory, was used during the season. The total number of animals dipped, including sheep used in the grazing experiments detailed below, was 2,615. Observations conducted in the Victor district during the past four seasons have led to the conclusion that the dipping of domestic animals alone is insufficient for the eradication of the disease. Sheep grazing as a means of tick eradication rests on the removal of undergrowth, the destruction of other mammals (domestic and wild), the destruction of the ticks themselves (principally by means of the lanolin in the wool of the grazing sheep), and the placing of the problem of tick eradication upon an economic basis, so that it may be carried out on an extensive scale without cost. The experiments during 1914 were conducted with 1,500 sheep, and it was estimated that 25,000 adult ticks were destroyed by these sheep during the season, or 50 times the number killed by the regular dipping of all other domestic animals on this territory. The Bitter Root Valley is narrow and flanked on almost every side by precipitous mountains reaching an elevation of 10,000 feet. The ticks and by far the greatest number of small rodents, are found in the foot-hills and along the lower reaches of the mountains. Higher up there are fewer ticks, except around the goat rocks, and fewer small animals to serve as hosts. A large band of sheep started in the foot-hills between two canyons and grazed closely for a week would pick up practically all the ticks in that locality and destroy perhaps 90 per cent. of them; then by shifting sheep straight back into the mountains to the next camp site, located above the tick zone, the engorged ticks would be dropped where the larvae on hatching would find few suitable hosts. The success of this method rests upon the removal back into the mountains of the sheep with the remaining attached ticks before they are fully engorged and ready to drop off for egg laying, a period which averages somewhat over 10 days from the time of attachment. This appears to have been the exact process by which the ticks were unwittingly eradicated from parts of the east side of the Bitter Root Valley several years ago, when from 30,000 to 40,000 sheep were grazed on the lines indicated. The geographical distribution of the disease includes California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming A bibliography of seven works concludes the article.

BACOT (A. W.). **Observations on the length of time that fleas (*Ceratophyllus fasciatus*) carrying *Bacillus pestis* in their alimentary canals, are able to survive in the absence of a host and retain the power to re-infect with plague.**—*Jl. of Hygiene, Cambridge*, 1st January 1915, Plague Supplement iv, pp. 770–773.

Ceratophyllus fasciatus is able to carry *Bacillus pestis* for periods up to 47 days in the absence of any host and subsequently to infect a mouse. Infected fleas, starved for 47 days and then placed upon a mouse, may not infect it for a further period of about 20 days. The positive results of the few experiments made do not necessarily represent the limit of time after which infection may take place, but they indicate that plague infection may persist in fleas for one or two months in cool weather and subsequently give rise to an epizootic.

BACOT (A. W.). **Notes on the development of *Bacillus pestis* in bugs (*Cimex lectularius*) and their power to convey infection.**—*Jl. of Hygiene, Cambridge*, 1st January 1915, Plague Supplement iv, pp. 777–792, 1 figs., 2 pls.

It is concluded that a meal of septicaemic blood from a mouse dying of plague is fatal to a certain percentage of *Cimex lectularius* and probably to all newly-hatched individuals. Bugs which are not killed by the infecting meal, are capable of carrying *B. pestis* and reinfecting mice after a period of 48 days' starvation. The development of *B. pestis* within the crop of bugs differs generally from that which takes place in the stomach of the flea, in respect of its slower and looser growth, this limitation of activity being accompanied by, and possibly being due to, the preservation of the structural character of the blood for many days after its ingestion into the crop. Mouth infection, when not caused by accidental or other injury to the bug while feeding, may be due to interruption followed by a second attempt. A bibliography of six works is given.

GUITERAS (G. M.). **Plague in Havana.**—*Jl. Amer. Med. Assoc., Chicago,* lxiv, no. 1, 2nd January 1915, pp. 29–34.

For fumigating small spaces such as rat-holes, runs and caves, Dr. Hugo Roberts, Chief Quarantine Officer of Cuba, has devised the following apparatus :—a wooden box, 12 by 4 inches, is made with a false bottom with two circular openings into which are inserted two 1,000 cc. bottles with rubber stoppers. Each of these is perforated with two openings to permit the passage of the glass tubing connecting the two bottles and each in turn to the rubber bulb and the outlet tube, to which, for convenience, a glass nozzle may be attached. The bottle to which the rubber bulb is connected, is charged with sulphuric acid diluted with two or three times its volume of water. The bottle to which the rubber tube and glass nozzle is attached, is charged with powdered potassium cyanide. By means of pressure on the bulb the acid solution is forced into the bottle containing the cyanide. The hydrocyanic acid gas evolved passes out of the glass nozzle, which has previously been inserted into a rat-hole, the open space around the nozzle having been sealed with a small quantity of cement mortar. The box is fitted with a movable handle which serves for carrying, facilitates the removal of the bottles for recharging, and prevents kinks in the exit tube by serving as a rest for it. The size described is suitable for small rat-holes ; for larger holes bottles of 5,000 cc. capacity are used, and a bicycle pump replaces the bulb. The small apparatus is charged with 150 grammes of powdered commercial potassium cyanide and about 300 grammes of crude sulphuric acid diluted with three times its weight of water. This is calculated to yield 400 cubic feet of 1·6 per cent. hydrocyanic acid gas. The apparatus is now extensively used in the anti-rat campaign in Havana.

PASQUALIS (L.). **Venezia e le Zanzare.** [Venice and mosquitos.]—*L'Amico del Contadino, Udine,* xxi, no. 1, 2nd January 1915, p. 4.

This article is part of a larger one dealing, in popular form, with bird protection from an agricultural point of view. It seems that so long as swallows are to be found in Venice there is no annoyance from mosquitos, but when the birds migrate late in July these insects appear in swarms.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

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Walker (E. L.) & Barber (M. A.). **Malaria in the Philippine Islands: I.—Experiments on the Transmission of Malaria with *Anopheles* (*Myzomyia*) *febrifer*, sp. nov., *Anopheles* (*Pseudomyzomyia*) *rossii*, *Anopheles* (*Myzorhynchus*) *barbirostris*, *Anopheles* (*Myzorhynchus*) *sinensis*, and *Anopheles* (*Nyssorhynchus*) *maculatus*.**—*Philippine Jl. Sci., Manila*, Sec. B, ix, no. 5, September 1914, pp. 381–439, 13 tables. [Received 25th March 1915.]

The following species of mosquito have been recorded as occurring in the Philippine Islands:—*Anopheles funestus*, Giles, *A. tessellatus* (*thorntoni*, Ludl.), *A. minimus*, Theo. (*mangyana*, Banks), *A. ludlowii*, Theo., *A. rossii*, var. *indefinatus*, Ludlow, *Anopheles* (*Stethomyia*) *pallidus*, Ludl., *Anopheles* (*Pyretophorus*) *fuliginosus* (*freerae*, Banks), *A. philippinensis*, Ludl., *A. pitchfordi*, Giles, *A. barbirostris*, Wulp, *A. pseudobarbirostris*, Ludl., *A. sinensis*, Wied. (*vanus*, Walk.), and *A.* (*Cellia*) *kochi*, Dönitz. Six of these are reported to be malaria-carriers, but *A. funestus* does not, in fact, occur in the Philippines.

Anopheles febrifer, Banks, sp. nov.,[*] *A. rossii*, Giles, *A. barbirostris*, van de Wulp, *A. sinensis*, Wied., and *A. maculatus*, Theo., are dealt with in this paper. *A. febrifer* is common in Laguna Province and appears to be a new species. It is abundant in shaded brooks, in depressions of the bank in wooded streams and especially where collections of drift twigs and leaves project in the water; it also breeds in open brooks or irrigation ditches, if the water be running and the banks shaded. The relations between *A. rossii* and *A. ludlowii* are discussed at length and the experiments made at the Philippine Medical School in 1909–10, which go to prove that *A. rossii* is not a carrier of malaria, are cited. *A. barbirostris* is widely spread in Laguna Province, but not numerous. *A. maculatus*, reported as a highland species, has been found in Laguna Province at 300 feet above sea-level, always on the banks of densely shaded brooks, limited in distribution and more plentiful in the cool season. *A. fuliginosus* was also bred from larvae collected. In the above statement the synonymy is given at length and reference given to authors with data as to the malaria-carrying capacity or otherwise of the species. All the mosquitos used in the experiments were collected and bred from larvae, and all were from Laguna Province, with the exception of the strain of *A. rossii* which breeds in brackish or salt water, the larvae of which were collected on the borders of Manila Bay, about 30 miles away. Details of the methods used for collecting the larvae are given and the necessity for collecting very large quantities is emphasised, as large numbers fail to develop and many of the insects die. The larvae were bred in battery jars and wide-mouthed bottles covered with netting and the insects allowed to escape into "biting cages" consisting of lamp chimneys set in a Petri dish filled with washed sand kept saturated with water; when not fed on blood, split raisins laid on the netting served as food. Cleanliness was maintained by frequent changes of food and water and even of the cages. The hospital on the Calamba Sugar Estate supplied the patients for infecting the mosquitos, which were allowed to bite the skin through the netting, generally in the early morning, as the light enabled those that were gorged to be

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[*] Described here for the first time. The proper name for this species is *Anopheles minimus*, Theo. (*teste* F. W. Edwards).—Ed.

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easily separated from those which were not and also from the males. Attempts to induce the insects to feed in the day-time were very rarely successful. The gorged mosquitos were killed with chloroform and dissected; 184 experiments were made and minute details are given of the results. There would seem to be no difficulty in rearing insects from larvae in the laboratory. The percentage of females was as follows :—*A. minimus* (*febrifer*) 53·8, *A. rossii*, 57·6, *A. barbirostris*, 58·3, *A. sinensis*, 59·8, and *A. maculatus*, 40·0. There is thus a slight preponderance of females, except in the last case, in which the numbers used hardly justify a conclusion. The percentage of females that lived to be dissected was, in the same order as above, 55·0, 42·2, 61·9, 78·2, 100·0. The avidity for human blood, *i.e.*, percentage of those that fed was, again in the same order, 54·8, 63·6, 49·4, 67·8, 50·0. A table is given showing the number of gametes in the blood and the percentage and intensity of infection of the mosquitos. The highest infection was obtained when the gametes in the blood were between 15–20 per cent. of the leucocytes, and the percentage of infected mosquitos, when this ratio was between 80 and 90 per cent., fell to 4·5 from 40·9 with a gamete percentage of 75–80. From this table, it is apparent that, given a malarial patient whose blood contains gametes above the limits of infectiousness, the percentage of infections and the intensity of infections do not depend alone upon the number of gametes ingested, but that some other factors must be involved in their determination. The percentage of each species infected, the nature of the infection, and other material details are carefully set out in tables. The rôle played by a species of *Anopheles* in the transmission of malaria in any country is stated to depend chiefly upon (1) its susceptibility and (2) its geographical distribution and prevalence; also, to some extent, upon (3) its avidity for human blood and (4) its domesticity. Of these factors, susceptibility is of fundamental importance. It is obvious that a mosquito which is immune or only slightly susceptible to infection with the malarial parasite, will, no matter how prevalent or widely distributed, be of little or no importance in the transmission of malaria; on the other hand, a very susceptible species may, although less prevalent, play a leading rôle in the spread of this disease. For example, *A. rossii* was collected in native houses in certain regions in India by Stephens, Christopher and others, in far larger numbers than was *A. culicifacies*, but while the latter species was found naturally infected with malarial parasites to the extent of from 4 to 16 per cent., not a single *A. rossii* was found infected. These authors, therefore, concluded that *A. rossii*, although more prevalent, played a subordinate, while the less plentiful *A. culicifacies* played the chief rôle in the transmission of malaria in these regions. The distribution and relative prevalence of the Philippine Anophelines is now being studied, but the importance of the 5 species now investigated, in the transmission of malaria in the Philippines can be roughly estimated as follows :—

A. maculatus, moderately susceptible to infection; semi-wild; avidity for human blood moderate; distribution very local; not an important carrier.

A. sinensis, low or negative susceptibility; wild; avidity for blood high; scarce and probably negligible as a carrier.

A. barbirostris, susceptibility feeble; relatively wild; very low avidity for blood; widely distributed, but scattered; not an important carrier.

A. rossii, susceptibility to infection low; most domestic of the Anophelines; avidity for blood high; widely distributed and relatively prevalent; possibly plays an important part in the dissemination of malaria.

A. minimus (*febrifer*) very susceptible; both wild and domestic; avidity for blood high; widely distributed and the most important mosquito concerned in the epidemiology of malaria in the Philippine Islands.

A list of works cited in the text concludes this paper, which contains a mass of minute and careful experimental detail to be consulted in the original by all who are interested in the subject.

KNAB (F.). **A New *Cuterebra* from Panama.**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, ii, no. 12, December 1914, pp. 187-188. [Received April 1915.]

Cuterebra maculosa, sp. n., is described from Panama, the host of this parasitic fly being probably one of the rodents in this region.

KNAB (F.). **New Data and Species in Simuliidae.**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, ii, no. 12, December 1914, pp. 177-180.

Descriptions and systematic notes are given of the following SIMULIIDAE: *Simulium pulverulentum*, sp. n., British Honduras; *S. rubicundulum*, sp. n., Mexico; *S. trivittatum*, Malloch, stated to be synonymous with *S. distinctum*, from Brazil. The genus *Parasimulium* is stated to have been erroneously founded on a male of *P. furcatum*, Mall., which was described as a female specimen.

HEARSEY (H.). **Nyasaland Sleeping Sickness Diary,** *Zomba*, pt. xxiv, 31st December 1914, 10 pp. [Received 17th March 1915].

Nineteen cases of sleeping sickness have been notified since the publication of the last memorandum, bringing the number of cases recorded up to the present to 211.

Of these nineteen cases, eight were discovered in the Sleeping Sickness Area of the Dowa district, nine in the Marimba district, one in the Dedza, and one in the South Nyasa district. Of the nine cases recorded in the Marimba district, eight were found on the Lake border, and one was notified from the fly area in the north-western section of this district.

The Medical Officer of the Proclaimed Area of the Dowa district, Dr. Conran, states that:—The headman and inhabitants of each village in the S.S. Area have been encouraged by every means short of compulsion to continue the work of clearing trees and scrub from the neighbourhood. As a result there is now a cleared area of varying extent round every village in the fly area. In some cases these are not of sufficient radius to have any very marked effect on the presence of fly in the village; but for the most part, the result has been excellent and these clearings must assuredly have played an important part in causing the decided fall in the number of sleeping sickness cases diagnosed in 1914, as compared with the previous year. The sum of £40 was allocated for the purpose of effecting clearings along the main roads in the S.S. Area. This amount has been partially expended in paying gangs of 50 men at a time, who were employed in clearing the trees and scrub from each side of the Domira Bay-Matumba-Kasu road. Apart from this, the experiment was tried of making every man in certain parts of the Sleeping Sickness Area devote one day in each month to clearing the scrub from the neighbourhood of roads uniting his village with the next. While this rule was in force, much excellent work was done, the Chunzi-Mtalamanja road in particular being cleared for a short distance on either side, along its whole extent.

Sacharov (N.). **Вредныя насѣкомыя, наблюдаемыя въ Астраханской губ. съ 1912 по 1914 годъ. Къ отчету станціи за 1914 годъ.**—[The injurious insects noticed in the govt. of Astrachan from 1912 to 1914].—From the report of the Station for 1914. Published by the Entomological Station of Astrachan, *Astrachan,* 1915, 29 pp.

The Staphylinid, *Paederus fuscipes,* Curtis, is found everywhere in the government throughout the year along the banks of rivers and lakes, especially in the delta of Volga. These beetles cause blisters when they are crushed on the skin, and the native fishermen and herdsmen suffer considerably from them.

Culex pipiens, L., and *Anopheles claviger,* F., swarm along the lower Volga and along the coasts of Achtoub, attacking man and animals; there are also swarms of *Simulium.* *Tabanus bovinus,* L., and *T. solstitialis,* Meig., both occur, mostly along the coast. *Chrysops caecutiens,* L., occurs in marshes and on the islands, and attacks men and animals; *Gastrophilus equi,* L., (*intestinalis,* Dg.) and *Stomoxys calcitrans,* L., are widely distributed, especially in the steppes, causing great suffering to animals. *Musca domestica,* L., is noticed as occurring in enormous numbers in the villages of the district of Krasno-Jar. *Argas persicus* is very troublesome on poultry, and caused the death of large numbers of young chickens in spring.

Fantham (H. B.) & Porter (A.). **Some Insect Flagellates introduced into Vertebrates.**—*Proc. Camb. Phil. Soc., Cambridge,* xviii, pt. ii, 22nd January 1915, pp. 39–50, 1 plate.

A series of experiments was performed in order to ascertain whether an insect flagellate might become pathogenic on being introduced into an unassociated vertebrate. Laveran and Franchini have shown that this is the case with nearly associated insects and vertebrates, *e.g.*, rat-fleas and rat or mouse, dog-fleas and dog [see this *Review,* Ser. B, ii, p. 89], but for the experiments here described, *Herpetomonas jaculum,* Léger, parasitic in the "water scorpion," *Nepa cinerea,* was the flagellate used and very young mice served as the vertebrate hosts. The following conclusions are drawn by the authors:—(1) Insect flagellates, *e.g.*, *Herpetomonas jaculum,* Léger, from *Nepa cinerea,* and

H. ctenocephali, Fantham, from *Ctenocephalus canis*, can live and multiply inside the mouse and dog respectively ; (2) if such flagellates are inoculated intraperitoneally or are fed by the mouth in food, the flagellates can find their way into the blood stream and internal organs of the vertebrate host ; (3) the insect flagellates are pathogenic to the vertebrates experimented upon, producing symptoms resembling those of leishmaniasis (kala-azar) ; (4) the oval post-flagellate forms appear to be more capable of developing in vertebrate hosts than are other stages of the herpetomonad parasite of the insect ; (5) it may be expected that the various leishmaniases, occurring in different parts of the world, will prove to be insect-borne herpetomoniases.

BALFOUR (A.). **Tropical Problems in the New World.**—*Trans. Soc. Trop. Med. & Hyg., London,* viii, no. 3, January 1915, pp. 75–110, 5 plates.

This paper, which is a record of a journey in the West Indies and the northern parts of South America, contains a large number of observations on medical and sanitary matters of which the following are of entomological interest. Anophelines do not travel so well over sea as does *Stegomyia*, though they have occasionally made the journey from Bombay to Trieste. Vessels on leaving Georgetown for Barbados are often swarming with mosquitos, but none are to be found on arrival at Bridgetown, the wind apparently clearing them from all exposed parts of the vessel, while those in the holds seem to be unable to survive tight battening for 36 hours. There are apparently suitable mosquito breeding pools and swamps in Barbados, though the fish they contain is not *Girardinus poeciloides*, but *Lebistes reticulatus*. Water-bugs of the genus *Notonecta* are very common in one pool which contained no fish, and possibly these destroy the larvae ; the matter requires investigation ; their larvivorous habits have already been recorded by Willcocks from Khartoum. *Stegomyia* and *Culex* flourish in Barbados and it is suggested that the sanitary administration has not sufficient powers for dealing with them. Filariasis is far from uncommon and *Stegomyia fasciata* swarms in St. George's. A scheme is on foot in Trinidad for planting bamboo on a large scale for the manufacture of paper pulp and the possibility of the cut bamboos supplying ideal breeding places for mosquitos will require attention. It is suggested that yellow fever may possibly exist as an epizootic in howler monkeys and the old negroes are of opinion that whenever these monkeys are found dying and dead in the High Woods, an epidemic of fever is at hand. A case is recorded of a man from Guanaco, on the Venezuelan mainland, dying from yellow fever in Trinidad. No case of yellow fever had been known at Guanaco for 25 years, but this man was employed eight miles from the place in the heart of a virgin forest in which red howler monkeys occur. *Stegomyia* (*Aedes*) *sexlineata*, exists in the High Woods and may be a carrier, and it is considered highly desirable to investigate the liability or otherwise of the indigenous S. American monkeys to yellow fever. Dr. Agramonte's unsuccessful transmission experiments in Cuba were made on Rhesus monkeys, originally natives of India. The mortality of monkeys and its connection with yellow fever epidemics is recognised in Brazil and Colombia, and in 1828, when yellow fever raged at Gibraltar, the monkeys died in large numbers.

It is noted that the distribution of the genus *Alouatta* (*A. seniculus* being the red howler) corresponds fairly closely with that of endemic yellow fever. A similar belief exists along the Orinoco in relation to the mortality among capybaras [see this *Review*, Ser. B, ii, p. 176] and outbreaks of equine trypanosomiasis "Reugnera." It is stated as a well known fact, that in Brazil and elsewhere there is a quinine-resistant strain of malarial plasmodium, considered to be due to the fact that the population has for years been saturated with quinine and that the parasites have become tolerant of it. Bebeeru bark, *Nectandra rodiaei*, Greenheart, is suggested as a substitute; it was used long ago, but fell into disuse, because occasionally it appeared to fail. At Baranquilla, where *S. fasciata* is said not to exist, the author caught a specimen. In some parts of Colombia, a tick, *Ornithodorus turicata*, is known to be the carrier of relapsing fever. Tabanids are said to attack equines chiefly on the fetlocks, though *Chrysops* is always found on the neck and withers.

SEN (S. K.). **Observations on Respiration of Culicidae.**—*Ind. Jl. Med. Research, Calcutta*, ii, no. 3, January 1915, pp. 681–697, 2 pls., 3 figs., 4 charts.

The following observations on the consumption of oxygen and evolution of carbon dioxide by mosquitos, were made mainly in order to ascertain whether differences in this respect exist between the larval, pupal, and imaginal stages. The object was to obtain data which might assist the construction of a curve showing the fluctuation of metabolic activity throughout the life of a mosquito, in so far as these fluctuations are correctly indicated by the amount of carbon dioxide given off in a stated time, and to determine the relative importance of atmospheric and dissolved oxygen. As the result of a large number of careful observations the following conclusions are arrived at:—(1) The average rate of consumption of oxygen was found for *Culex sitiens* (*microannulatus*), larva (full grown) 1·1 c.mm. per hour; *C. sitiens*, pupa, 1·9 c.mm. per hour (0·84 grammes per kilo body weight); *Stegomyia scutellaris*, pupa, 1·6 c.mm. per hour, and *C. sitiens* adult, 25 c.mm. per hour. (2) The differences in rate of pupal respiration seemed to depend on the species rather than on difference in size. (3) There was no evidence that pupae absorb nitrogen as well as oxygen. (4) The larva or the pupa absorbs oxygen at approximately the same rate till the death point. (5) The value of dissolved air in the respiratory act of the pupa and the larva is very small or negligible, and the elimination of the gills seemed to have little effect on larval respiration. (6) Want of oxygen is more quickly and keenly felt by, and sooner kills, the pupa than the larva. *Culex* is more susceptible than *Stegomyia*. In an Addendum, Dr. S. Da Costa Lima's experiments are criticised.

CRAGG (Capt. F. W.). **A preliminary Note on Fertilization in** *Cimex*.—*Ind. Jl. Med. Research, Calcutta*, ii, no. 3, January 1915, pp. 698–705, 1 pl.

This is a criticism of Berlese's account of the mode of fertilisation in *Cimex*. The cycle of changes described by him are stated to be not confirmed.

Hossack (W. C.). **Report on a visit to various European Ports in Reference to Existing Quarantine and Sanitary Arrangements and the Measures Proposed against the Introduction of Yellow Fever into India.**—*Ind. Jl. Med. Research, Calcutta*, ii, no. 3, January 1915, pp. 791–813.

The author, under instructions from the Government of India, visited a number of European ports with the main object of ascertaining: (1) The general trend of opinion as regards quarantine and other methods for the prevention of the importation of disease by sea. (2) The limitations and shortcomings of the Clayton process of fumigation by SO_2, the advantages and disadvantages of rival methods and the possibility of applying other gases than the two generally used, SO_2 and CO. (3) Methods of inspection of food imports. (4) Regulation of the construction of ships. (5) The advisability of changes in the administration of the maritime sanitary service.

The above points were considered in connection with the proposals for the establishment of a sanitary station at Diamond Harbour, specially fitted to deal with ships infected with yellow fever. The Clayton process of fumigation for the extinction of fire and the destruction of insects and vermin is now in universal use all over the world. Briefly, it consists of an apparatus in which sulphur is burnt to produce sulphur-dioxide (SO_2) gas of a fixed and regulated strength and a fan to propel the gas into the hold or other space to be disinfected. Its advantages are that it kills rats, fleas, mosquitos, cockroaches and bugs, that it is cheap in its application and in practice is not dangerous to human life; an exposure to 3 per cent. sulphur-dioxide for 8 to 12 hours with the hatches closed till next day, kills the germs of disease. It is the most reliable process for the destruction of mosquitos possibly infected with yellow fever; but it has disadvantages, which may be briefly summarised as follows. There are grave difficulties in its application to the hold of a ship full of cargo. With certain articles of cargo, such as baled jute or baled cotton, even where there is penetration of the gas, there is an enormous amount of absorption. It has been proved that a bale of cotton or jute will require for saturation, 100 times its bulk of Clayton gas, 10 per cent. The result is that gas to the extent of several times the bulk of the ship may be injected and yet the deeper recesses of the hold may never be reached, as the gas is absorbed as it is injected. In addition there is the mechanical difficulty of penetrating a tightly packed cargo. Moreover there are certain classes of goods which are irretrievably damaged by fumigation by SO_2, *e.g.*, food-stuffs, such as wheat, potatoes, flour, fruits and meat. Grain, thoroughly treated, will hardly germinate at all and yields a flour that will not make edible bread. Though there is a large trade of Indian wheat for England, which comes as part cargo with oil seeds for France, and these cargoes are habitually fumigated in French ports, no questions have been raised as to damage done. In view of the experiments of the Local Government Board, the explanation of the lack of complaint must be the inefficiency of penetration or the fact that fumigation is not thoroughly carried out. It seems certain that numerous living rats are found in London in ships that have been recently fumigated. The disadvantages are so marked that the author tried to find out if there were any other gas that would kill mosquitos as certainly and at the same time be less likely to inflict on general cargo the damage caused by SO_2. A further disadvantage of the use of SO_2 is the risk of bleaching coloured cloths by the conversion of part of the sulphur dioxide into sulphuric acid, but the experiments that demonstrated this, also showed that this risk is a negligible one, when the manner in which cloths are generally packed for import into India is taken into account. There is also considerable risk of fire, owing to the use of flake charcoal as an insulating packing for refrigerator plant and three cases have occurred in Bombay from this cause.

The other processes are described and their advantages and disadvantages discussed. Halle's modification of the Marot apparatus allows of complete control over the strength of gas (SO_2) used, 3 per cent. for rats and 8 per cent. for bugs, but the cost is the chief objection. The Giemsa apparatus produces a mixture of carbon monoxide (CO) and carbon dioxide (CO_2) by passing air over burning coke ; this is regarded as dangerous, as the gases are odourless and non-irritating and fatal accidents have occurred. The gases kill rats, but not insects and the killing of plague rats, while at the same time their infected fleas are released, multiplies the danger of infection for those handling cargo, etc. ; these gases have no general disinfecting qualities and the original cost of the plant is high. The Harker process is similar in principle ; waste gases of the ship's furnaces being employed, the dangers and defects are the same as with the Giemsa process. The Rubner apparatus is based on the application of formaldehyde vapour to goods enclosed in a partial vacuum so as to secure penetration. The temperature is a very important factor ; at 70° C. (160° F.) moist heat, as good results can be obtained as with the vacuum ; at 10° C. (50° F.) the effect is very small. This may be effected either by boiling a 5–10 per cent. solution of formaldehyde in water over a lamp in a closed chamber containing the articles, or by floating in water in a bath a vessel containing 40 per cent. formaldehyde, 1 lb. for every 1,000 cubic feet ; ½ lb. of potassium permanganate is then rapidly added ; the re-action is violent and dense fumes of formaldehyde are given off. Steam is then admitted until a temperature of 70° C. (160° F.) is reached and maintained for 4 hours, very little steam being required.

DRAKE-BROCKMAN (R. E.). **Reports on an Outbreak of Relapsing Fever among the Camel Constabulary in Somaliland.** [Received from the Colonial Office 4th February 1915.]

In these reports it is stated that on the return of a company of Camel Constabulary from Hargeisa to Galoleh, no less than 13 per cent. of the men were sick with relapsing fever, so far unknown to exist in British Somaliland except at the coast town of Bulhar, where an epidemic occurred a few years ago, which the author thought was due to infection from East Africa. It is at present not feasible to say whether the disease has spread inland from Bulhar to Hargeisa or vice versa. In the latter case, it must have come across Africa. The transmitting host, *Ornithodorus savignyi*, has been found at Burao, Ber, and Ged Aboukr on the Arori Plain, as well as at Bulhar and Hargeisa. *O. savignyi* is invariably found in dirty and unsanitary surroundings where men and animals congregate, such as in the soil in and around camping grounds of long standing, under trees which afford shade, and around wells where animals are watered. It bites both men and animals, but as far as is known does not convey any parasite harmful to the latter. There is great danger of the tick being spread by animals watered at the wells. The author caught several ticks on the legs of his pony, which they were obviously biting. Recently, malignant tertian malaria has been introduced by several men of the Camel Constabulary who visited the Tug Wagali, on the borders of British and Abyssinian Somaliland, but owing to the absence of mosquitos, the disease has not spread. [See also this *Revie* Ser. B, i, p. 116; ii. p. 8.]

KUNHARDT (Capt. J. C.) & TAYLOR (Capt. J.), assisted by Assistant-Surgeons GANPATI IYER (R.), KESAVA MENON (T.), VARADHACHARI (B. V.), RAGHAVENDRA RAO (R.). & NARAYAN RAO (K.). **Epidemiological observations in Madras Presidency.**—*Jl. Hygiene, Cambridge*, Plague Supplement iv, 1st January 1915, pp. 683–751, 7 maps, 30 charts.

Chapter vi of this paper deals with rat and flea prevalence in the Madras Presidency. An examination conducted in the severely infected, moderately infected, and plague-free areas has shown that in none of them, in the light of the Commission's experience elsewhere, was the number of fleas too small to prohibit the development of an epidemic in them. Severe epidemics have occurred in the Bellary district and in the Nilgiris, where rats and fleas are less numerous than in places which have escaped infection ; facilities for communication with infected districts, or a suitable climate, may be supposed to have made up for the deficiency in rats and fleas. Yet in Hosur taluq, for example, where fleas are numerous on rats (nearly 15 per rat at the height of the plague season), epidemics have on the whole been more severe and persistent than in Coimbatore and Vaniambadi, at which places 10 fleas per rat was the maximum number found. In Madura and Cuddalore, where approximately the maximum average number of fleas was only 6 per rat, plague has not occurred. The number of fleas on rats is, however, dependent to a great extent on the climate. Experiments have shown that rats caught in places in Madras which have been free from plague epidemics, are very susceptible to plague infection. The existence of such susceptible rats at the present time, in view of the fact that plague has now been present in the country for more than 17 years, indicates that conditions exist in those places which have hindered the successful implanting of infection in them. The authors are inclined to attribute this comparative immunity to the warm climate obtaining over the greater part of the Presidency and conclude that the physical features and climate there have an important influence in limiting the distribution of plague in it.

MINCHIN (E. A.) & THOMSON (J. D.). **The Rat-Trypanosome,** *Trypanosoma lewisi*, **in its Relation to the Rat-Flea,** *Ceratophyllus fasciatus.* —*Qtrly. Jl. Micro. Sci., London*, lx, pt. 4, January 1915, pp. 463–692, 10 plates, 24 figs., 13 tables.

A detailed account is given of investigations which have been carried on during the last five years on *T. lewisi* and its relation to *C. fasciatus.* The first part of the memoir describes the technique of the experiments and gives details of the anatomy and histology of the flea. The second part deals with the development of *T. lewisi* in the flea; the trypanosome is confined throughout its development to the digestive tract, where it passes through various phases, some of which are intracellular in the epithelium of the stomach. No experimental proof of sexual phases was obtained. The third part deals with the problems of transmission and development of *T. lewisi.*

The following propositions have been experimentally established, details of the experimental evidence being given in each case:—(1) *T. lewisi* is transmitted from rat to rat by the rat flea, *C. fasciatus*; (2) transmission takes place by the cyclical method and has not been proved to occur by the direct method; (3) trypanosomes appear in the blood of the rat from five to seven days after infection and this multiplication in the blood of the rat comes to an end 11 to 13 days after infection; (4) the cycle of development in the flea requires a minimum of five days for its completion; (5) transmission is never effected until the developmental cycle is completed, *i.e.*, until at least five days have elapsed since the first exposure of the fleas to infection; (6) infection of the rat is brought about by the small trypanosome-form which is the final form of the development; (7) the final infective form of the cycle is developed first in the rectum on the fifth day of the developmental cycle, but may appear later in the stomach; (8) the developmental forms of the trypanosomes in the flea are not infective when inoculated into the rat during a period extending from a short time (½ hour ?) after being taken up by the flea until the developmental cycle is complete; (9) the flea, once it has become infective, remains so for a considerable time; (10) the trypanosome does not penetrate into the salivary glands of the flea, but is confined during its whole development to the digestive tract; (11) the rat can become infected by eating infected fleas, but not until the developmental cycle of the trypanosome in the flea is completed; (12) infection of the rat is effected contaminatively, by way of the rat's mouth, by the rat licking from its fur or skin the moist faeces of infective fleas containing the final propagative form of the cycle; (13) hereditary transmission of the trypanosome from flea to flea does not take place; (14) the trypanosomes in the blood of the rat render fleas infective very soon after they make their first appearance in the blood, before their multiplication period is over.

Experiments failed to prove whether the flea can infect the rat by inoculating the trypanosomes into it through the proboscis. The following conclusions are also given: (1) the trypanosomes succeed in establishing themselves in the flea and rendering it infective to the rat in only a small proportion of the individuals that ingest them; (2) starvation of the flea during the incubation period of the cycle does not inhibit, nor does it necessarily retard, the developmental cycle of the trypanosome in the flea; (3) starvation of the flea following immediately on an infective feed favours the establishment of the haptomonad phase in the rectum, while starvation begun after the incubation period in the flea is over, favours migration to the post-pyloric end of the intestine and the establishment of the haptomonad phase there. Experiments failed to prove whether the first phase of the development of the trypanosomes, *i.e.*, the intracellular multiplication in the stomach of the flea, continues beyond the second feed of the flea, counting as the first feed that by which it became infected. A bibliography is appended and the text is freely illustrated with excellent figures.

Finding Fleas on Plague Rats.—*Jl. Amer. Med. Assoc., Chicago*, lxiv, no. 2, 9th January 1915, p. 126.

Combing rats for fleas, particularly plague-infected rat-fleas, presents certain disadvantages which have been obviated in the following method reported by C. F. Mason of the Panama Canal Department of Health. From several tests, it was found that fleas began to leave a rat as early as 15 seconds after death and all had left the body in a little more than 2 hrs. 15 mins. The rat was therefore killed by cephalotripsy and its body immediately placed on a glass rod grating over water contained in a very large glass jar or the inverted cover of a garbage can. On leaving the body, the fleas drop into the water, and may be conveniently collected by means of a medicine dropper. In this way, higher counts have been obtained than by chloroforming and combing or by any other method.

DUKE (H. Lyndhurst). **The Wild Game and Human Trypanosomiasis; with some Remarks on the Nomenclature of certain Pan-African Trypanosomes.**—*Jl. Trop. Med. & Hyg.*, xviii, no. 2, 15th January 1915, pp. 13–16.

It is stated that striking confirmation has been obtained of the author's conviction that the sitatunga antelopes on the uninhabited islands of the Victoria Nyanza are acting as a reservoir of *T. gambiense* and are responsible for the continued infectivity of the lake shore. Two of the fly-boys who have, during the past three years, worked with Dr. Carpenter on the islands have developed sleeping sickness of the Uganda type, and trypanosomes have been demonstrated in their glands. They have been constantly exposed to the bites of *G. palpalis* during their work on the islands. For 18 months and 33 months respectively they have resided on the lake shore, chiefly on the islands, and have not been exposed to bites of any other *Glossina*. They constitute therefore what is practically the equivalent of the crucial test, human inoculation, showing conclusively that *T. gambiense* still exists in these island flies five years after the removal of the inhabitants. It is considered that *T. nanum* and *T. congolense* have more claim to be regarded as separate species than *T. ugandae*, *T. brucei*, *T. pecaudi*, etc. Experiments show that in the wild fly of the Northern Province of Uganda, in *G. morsitans* country, there exist two trypanosomes with the specific characters of *T. nanum* and *T. congolense* (*pecorum*) respectively. The importance of this distinction is obvious when it is realised that carnivora, rodents, and the Anthropoidea are unaffected by *T. nanum*, but succumb to *T. congolense*. Here the tendency of laboratory results is to eliminate, as an unimportant variation, a character which natural selection seems to have fixed as a specific difference. But the tendency which is particularly deprecated by the author is an opposite one, namely to manufacture specific differences between strains of trypanosomes which natural tests indicate to be identical. Had more attention been paid to the comprehensive study of these various organisms—*T. brucei*, *T. pecaudi*, *T. ugandae*, *T. rhodesiense*, etc.—such a variety of names would never have arisen. In considering the diagnosis of any trypanosome, the first test to apply is concerned with its behaviour in the *Glossina* host. Evidence of this nature is unfortunately not available in the case of all the above trypanosomes. The nomenclature to be adopted in dealing with the wild game parasites is a difficult one. In the case of *T. rhodesiense*, the name *T. brucei* var. *rhodesiense* appears to meet the situation, and to express better the relationships involved.

BAHR (P. H.). **Notes on Yaws in Ceylon, with Special Reference to its Distribution in that Island and its Tertiary Manifestation.**—*Ann. Trop. Med. Parasit., Liverpool*, Ser. T.M., viii, no. 4, 29th January 1915, pp. 675–680, 1 pl.

It is stated that, although the house-fly, *Musca domestica*, has on experimental grounds been incriminated as a conveyer of the yaws spirochaete in Ceylon by Castellani, in that island, at least on epidemiological grounds, there is little to support this supposition. Firstly, because this insect is unprovided with piercing mouth-parts and from the nature of its habits is unable to inoculate the germ on an unbroken skin. Secondly, because this fly is far more abundant in the elevated planting districts where the conditions appear to be more favourable for its propagation, and where yaws appears to be unknown, than in the low country where the disease is common.

SANI (V.) & GUARDASONI (M.). **Un rimedio poco costoso contro i pidocchi dei bovini.** [A cheap remedy against cattle ticks.]—*Rivista Agricola Commerciale, Reggio-Emilia*, iv, no. 1, 1st January 1915, p. 19.

It is stated that water in which potatoes have been boiled, acts as an insecticide against cattle ticks owing to the solanine which it contains. It is considered worthy of a trial; the fluid should be applied with a brush.

CHAPIN (R. M.). **A Field Test for Lime-Sulphur Dipping Bath.**—*U. S. Dept. Agric., Washington, D.C.*, Bull. 163, 12th January 1915, 7 pp., 2 tables, 1 fig.

The lime-sulphur dipping baths now in use under official regulations in the United States consist essentially of a mixture of calcium polysulphide and calcium thiosulphate. The Bureau of Animal Industry has no present proof that the latter is of any value for the treatment of scabies in either cattle or sheep, and the efficiency of the bath is regarded as dependent on the polysulphides present. Home-made dips are liable to great variations of strength, owing to the quality of lime used, and to deterioration by storage; considerable decomposition also takes place during use from exposure to air, and some sort of field test of the efficiency of the dip is therefore desirable. The test used is a standard iodine solution, with sodium nitroprusside as indicator; the method, though not scientifically accurate, under the conditions gives results which are good enough for the purpose. A field testing oufit is described and figured, and tables are given by which the quantity of concentrated dip to be added to each 100 gallons of bath to restore it to standard strength (1·5 per cent. sulphur as sulphide) may be found by inspection.

MASON (F. E.). **Veterinary Pathological Laboratory.**—*Minist. Agric., Egypt; Vet. Service, Ann. Rept. for 1913. Cairo*, 1915, pp. 13-25.

During 1913, 155 cases of acariasis were observed in horses and mules, 1 in an ass and 1 in a goat. Two cases of filariasis in camels and 12 cases of piroplasmosis in Sudanese cattle are reported, while in Egyptian cattle 318 cases of Texas fever and 90 of Egyptian fever occurred. For trypanosomiasis the figures were: Camels, 5; horses, 2; Egyptian cattle 1; Sudanese cattle, 1; and negative, 683. Piroplasmosis of Egyptian cattle is of four kinds:—Texas fever, a small *Piroplasma* resembling that of Egyptian fever, *Piroplasma mutans* and a fourth form with all the characteristics of East Coast fever, which is serious and often fatal. As the disease is unknown as yet in Egyptian cattle, the Sudanese cattle at Cairo and Luxor have been searched for ticks and the following were found:—*Rhipicephalus bursa, Hyalomma egyptium, Amblyomma lepidum, Margaropus* (*Boophilus*) *annulatus, Rhipicephalus evertsi, R. oculatus* and *R. sanguineus.*

ROUBAUD (E.). **Sur un essai d'élevage de Glossines dans les laboratoires d'Europe.** [An attempt to breed *Glossina* in European laboratories.]—*Bull. Soc. Path. Exot., Paris,* viii, no. 1, 13th January 1915, pp. 34-36.

At the end of December 1913, the author brought back from Senegal some twenty living pupae of *Glossina palpalis* and *G. morsitans.* The cold felt during the voyage caused the older specimens to die, but the more recently formed ones produced adults in the laboratory of the Pasteur Institute. So far as the author knows, these are the first adults reared in Europe. Placed in a Roux incubator maintained at an average temperature of 24°-25° C. [76°-77° F.] and fed daily on guineapig and rabbit, they lived and reproduced satisfactorily. The *G. palpalis* pupae, which came from the district of Sangalkam near Rufisque, only produced two males. These small-sized but well-built flies survived from the 17th January to 26th February. The *G. morsitans* pupae came from the Lower Salum, near the borders of British Gambia. They produced two males and six females. One of the latter deposited four pupae and originated a strain which still lasts, after a year's time, in surroundings kept at 76°-77° F. and at 50 to 55 per cent. of average humidity. Only twenty flies are now living, as the mobilisation in August and September interfered with the work and resulted in mishaps and losses. It is certain, however, that *Glossina* can be kept and bred in Europe under such conditions as make prolonged experiments possible. If the incubator is small, it is necessary to provide for circulating air through it, otherwise hatching is interfered with and the development of the adults is suspended. *G. morsitans* being a xerophilous fly, humidity above 60 per cent. should be avoided. During the month of June 1914, some of these flies were placed in the Jardin d'Acclimation at Paris. They remained there for over a week at a temperature varying from 10°–27° C. [50°–80° F.]. It would therefore appear that the flies can live in France at ordinary summer temperatures, though real acclimatisation is impossible.

CARTER (H. R.). **Impounded Waters: Their Effect on the Prevalence of Malaria—Survey at Blewets Falls.**—*Public Health Reports, Washington, D.C.*, xxx, no. 1, 1st January 1915, pp. 15–33, 1 sketch map.

This survey was undertaken in order to determine the relations of the pond of the power plant at Blewetts Falls, N.C., to the breeding of *Anopheles*. In order to have an idea of the breeding places in the normal river valley before the dam was built, a survey was made of two sections of the valley—each a little less than a mile long—one beginning a mile above a backwater and running about a mile up stream, and the other beginning one-half mile below the dam and running about a mile down stream. Both of these were surveyed physically and biologically. Below the dam, *Anopheles* were breeding freely over a wide extent of marshy flat used as a pasture, but were scarcer above the pond. The creeks emptying into the pond were found to be breeding *Anopheles*, and as the small streams which emptied into the pond some distance from the dam practically all contained mosquito larvae in that portion of their beds which would have been submerged had the stream emptied into the river closer to the dam, it is probable that those which did so empty into the river close to the dam were formerly breeding places, though now covered by the pond. The conclusion reached is that the valley now occupied by this pond formerly bred *Anopheles* over a large area. A survey of the pond was next undertaken. In this were included the backwater of creeks and their branches, the pools left by the subsidence of the pond, the pools and marshes which are not drained on account of the existence of the pond, the side pools of creeks and branches filled because they were backed up by the pond and left by its subsidence, and, in short, every collection of water due to the existence of the pond either directly or indirectly. The result aimed at was to estimate the total effect of the pond in the production of collections of water, and hence of *Anopheles*. The plant at the dam is partially shut down from Saturday noon to Monday morning, and also partially every night. This produces a regular change in the level of the pond, independent of the rise of the river which supplies it. Besides the mosquito larvae, the animal life found in the pond included fish, water-boatmen, Gyrinid beetles, a water-spider, and the larvae of the mosquito *Psorophora*. The two last-named were not common enough to be of probable importance as preying on *Anopheles* larvae, though the others exercised some control. The naked banks caused "floatage" (the small pieces of bark and small sticks which gather like a scum on the water) to be stranded ashore, a condition unfavourable to the larvae, as floatage plays an important rôle in protecting larvae. The change of level of this pond is an efficient deterrent to mosquito production as much floatage is stranded and the larvae are rendered more accessible to fish. The effect of winds is to lessen breeding and it is greater in the case of the pond than it can be in a river or stream. In conclusion, it may be said that the pond has enormously diminished the area of breeding places of *Anopheles*, both adjoining the river and in the valleys of the creeks. This statement however only refers to the condition of the pond in the summer of 1914.

LE PRINCE (J. A. A.). **Impounded Waters : A study of such waters on the Coosa River in Shelby, Chilton, Talladega, and Coosa counties, Ala., to determine the extent to which they affect the production of Anophelines, and of the particular conditions which increase or decrease their propagation.**—*Public Health Reports, Washington, D.C.*, xxx, no. 7, 12th February 1915, pp. 473–481, 2 sketch-maps.

During October and November 1914, a survey was made of the water of the Coosa River, impounded by a dam about 14 miles from Clanton, Chilton County, Ala. The impounded water extends for about 20 miles upstream from the dam. Pine trees are very numerous in the area examined, many standing close to the banks, while some were allowed to remain in the areas that were flooded. The needles of the pine trees that fell into the lake or were carried into it by streams, collected into large or small groups and afforded most excellent protection for *Anopheles* larvae. They constitute the most important factor for the production of these larvae in the lake, as well as in some of the streams beyond and outside the influence of the impounded waters, and over 90 per cent. of the *Anopheles* larvae and pupae collected in the lake were taken by dipping among collections of pine needles, where they were found in all stages of development. Frequently where pine needles were absent, *Anopheles* larvae were either very scarce or absent ; where pine needles were present in collections of débris, the larvae were almost invariably to be found alongside of a floating pine needle, rather than against a piece of bark, twig or other débris. The relative importance of places where larvae were found in the lake was in the following order :—Groups of pine needles (when not too closely compacted) ; débris—consisting of bark, leaves, and twigs ; long grass lying on the water surface ; dead leaves of trees floating on the surface (present from September to November) ; logs, branches, stumps, etc. This inspection was made during the late autumn, so that conditions at other times make further examination necessary. A total of 1,271 adult mosquitos emerged from material collected. Of these, 1,152 were *Anopheles punctipennis*, 18 *Culex* (species not yet determined), and 101 *A. quadrimaculatus*. The adults of the latter species found in natural hiding places were too small in number to have any practical bearing on the spread of malaria in the surrounding country. The scarcity of small larvae-destroying fish in the lake in 1914, is the reason why many larvae and pupae of *A. punctipennis* were present at some of the inlets examined.

Copeman (S. M.). **Note on a successful method for the extermination of Vermin infecting Troops.**—*Brit. Med. Jl., London*, 6th February 1915, pp. 247–248.

Troops in camp in the South of England were found to be infested with vermin, and measures had to be devised under practically field-service conditions for facilitating cleanliness, including arrangements for hot baths. The men found to be infested were directed to take a hot bath, dry themselves and then lather their bodies with cresol soap solution (Jeyes' fluid $1\frac{1}{2}$ oz., soft soap $1\frac{1}{2}$ lb., water 10 gals.) and allow the lather to dry on; the shirts were washed in the same mixture in boiling water; the tunics and trousers were turned inside out and the lather rubbed well into the seams and allowed to dry on. Blankets were treated by first soaking in cresol soap solution and subsequently washing in the ordinary way. The method both for the soldiers and their clothing has been found to be thoroughly satisfactory.

Shipley (A. E.). **Flowers of Sulphur and Lice.**—*Brit. Med. Jl., London*, 27th February 1915, p. 295.

Dr. Shipley quotes C. P. Lounsbury as to the supply of the troops in South Africa by the Government with sulphur sown into small bags of thin calico and secured to the underclothing next to the skin, as a preventive against lice. The bags are about 2 inches square, and are generally worn one on the trunk and one against each leg. Dr. H. H. Tomkins is quoted as saying that sulphur well rubbed into the underclothing was perfectly successful in preventing lice from getting under plaster of Paris jackets in the Children's infirmary at Liverpool. Further, Mr. B. Harman, at the No. 2 General Hospital at Pretoria during the Boer war, finding that he was infested with lice, and failing to obtain insect powder, tried dusting his clothes and bedding with sulphur, with the best results; and on board ship he found the same method equally efficacious against cockroaches.

Van Dine (D. L.) U. S. Bur. Entom. **The losses to Rural Industries through Mosquitoes that convey Malaria.**—*Southern Med. Jl., Mobile, Ala.*, viii, no. 3, 1st March 1915, pp. 184–194, 2 figs.

Anopheles quadrimaculatus was the species concerned in conveying malaria in 1914 in the vicinity of Mound, Louisiana, the other two species found, *A. punctipennis* and *A. crucians*, only occurring in very small numbers. The records of breeding places show that *A. quadrimaculatus* is partially domestic in its habits. It was taken from water stored in cisterns and in barrels, from water in surface wells and from troughs used for watering stock. Greater numbers were found in the bayous, seasonal sloughs, pools in the woods and holes from uprooted trees. In open collections of water of a permanent character, having margins free from vegetation or rubbish, the top minnows and predaceous aquatic insects were very effective in controlling the larvae of *Anopheles* and other mosquitos.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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Thibault (J. K., Junr.). U.S. Bur. Entom. **A Comparative Study on the Losses to Rural Industries from Malarial Mosquitoes.**—*Southern Med. Jl., Mobile, Ala.*, viii, no. 3, March 1915, pp. 195–196.

At Scott, Arkansas, the prolonged cold weather in winter and spring delayed mosquito breeding and then the unprecedented drought, which began about mid-May, made itself felt. The mosquitos were driven from all out-houses and most of the smaller dwellings and from even rank growths of vegetation, all of which normally give adequate protection. At this time, most of the adults taken were from underground dwellings. *Anopheles quadrimaculatus*, Say, was found in every house where malarial cases occurred, except one, and this was a case which relapsed at a time when very few mosquitos were to be found anywhere. The larvae of this species were found frequently in 1914 in rain barrels and cisterns, but it was very difficult to breed adults from them in the water from such places. No *Anopheles* were found breeding in either foul or very muddy water. No evidence was found that adults fly far from their breeding places. Negative results were obtained in an interception experiment where flight traps were placed over water and situated approximately 250 yards from either bank. On the plantation where a study was made of the incidence of malaria during the crop season, the very small percentage of malarial cases was noticeable, as was also the very high percentage of aestivo-autumnal and quartan infections. These types of malaria are evidently more resistant to the unfavourable influence of the unusual weather conditions, but whether the survival of these types over the tertian was due to influences acting on them while in the body of man or that of the mosquito, is unknown.

Lutz (A.) & Neiva (A.). **As "Tabanidae" do Estado do Rio de Janeiro.** [The Tabanidae of the State of Rio de Janeiro.]—*Memorias Inst. Oswaldo Cruz, Rio de Janeiro*, vi, no. 2, 1914, pp. 69–80. [Received May 1915.]

Gadflies are seldom seen in the city of Rio, but are to be found in the suburbs, situated in part on the slopes of the mountains near the city. The Institute in Manguinhos is at some considerable distance from the mountains, lying between the suburbs and the shore of the bay. Here *Neotabanus obsoletus*, Wied., occurs, and its larvae probably live in the mangrove swamps, although this has not yet been proved. Other species peculiar to the coast zone are, *N. comitans*, Wied., and *N. ixyostactes*, Wied., the former being abundant and the latter very rare. They do not exclusively inhabit mangrove swamps, for they occur in other States, far inland. *Tabanus importunus*, Wied., was taken, but is seldom found in this latitude, though common further north. Besides some common species of *Neotabanus* related to *N. trilineatus*, Latr., the only other species found was *Chlorotabanus mexicanus*, which is very widely distributed, but easily overlooked, as it is crepuscular in habits. *N. ochrophilus* and *N. triangulum* were also bred from larvae found in the mud of a small stream in the Institute grounds. Although a fai number of horses and cattle were kept here, no other species wer noticed. Neiva collected Tabanids during a whole year in Xerém which is in the swamp district, but at the foot of the Serra de Estrella, so that some mountain-forest species are found together with those common to the coast. A list is given of the 38 species determined. The second collecting area was near Petropolis, and includes the neighbouring mountains, which in places rise to about 6,500 feet. Twenty-seven of the species found in Xerém and 18 others were obtained. After enumerating 13 species found in various other localities, a list is given of 9 species from Sarapuhy, a typical swamp district. The lists include most of the species occurring around Rio, in the neighbouring mountains and on the borders of adjoining States, amounting to some 80 in all in this comparatively small area. *Orthostylus ambiguus*, gen. et sp. n., *Melanotabanus fuliginosus*, gen. et sp. n., and *Dicladocera conspicua*, sp. n., are described. The name of *Pseudacanthocera sylverii*, Macq., is proposed for the species described by Macquart as *Silvius sylverii*, and later called *Tabanus macroceratus* by Bigot.

LUTZ (A.). **Contribuicão para o conhecimento das Ceratopogoninas do Brazil. Terceira memoria. Aditamento terceiro e descrição de especies que não sugam sangue.** [A contribution to the knowledge of Brazilian CERATOPOGONINAE: Third memoir: Third supplement and description of the non-bloodsucking species.]—*Memorias Inst. Oswaldo Cruz, Rio de Janeiro*, vi, no. 2, 1914, pp. 81–99, 2 pls. [Received May 1915.]

The species named *Ceutrorhynchus setifer* by the author proves to have been described earlier as *Cotocripus caridei* by Bréthes from Buenos Aires and this name must stand for it. Two new species, *Johanseniella fluviatilis*, sp. n., and *Culicoides pachymerus*, sp. n., are described. The following non-bloodsucking species are described: *Ceratopogon bromelicola*, sp. n., a true *Ceratopogon*, the larvae of which live in the water of *Bromeliaceae*, and which is probably widely distributed; *C. filibranchius*, sp. n., found around the breathing roots of the *Avicennia* growing in marshy land; *Forcipomyia squamosa*, sp. n., *F. squamitibia*, sp. n., *F. bicolor*, sp. n., and *Atrichopogon flavipes*, sp. n., described from individuals of both sexes from a hole filled with sea-water and from a light trap near marshy land. On account of their hairless wings, the following species, taken in a light trap at Manguinhos, are placed in the genus *Palpomyia*, viz.: *P. spinosa*, sp. n., *P. multilineata*, sp. n., *P. fuscivenosa*, sp. n., and *P. dorsofasciata*, sp. n.

DE ALMEIDA CUNHA (R.). **Contribuição para o conhecimento dos sifonapteros brazileiros.** [Contribution to the Knowledge of the Brazilian Siphonaptera.]—*Memorias Inst. Oswaldo Cruz, Rio de Janeiro*, vi, no. 2, 1914, pp. 125–136, 3 figs.. 2 pls. [Received May 1915.]

The following Brazilian fleas are described: *Stenopsylla cruzi*, gen. et sp. n., on *Didelphys aurita* and *D. opossum*; *Rothschildella occidentalis*, sp. n., on *Dasypus novemcinctus*; *Pulex conepati*, sp. n., on *Conepatus suffocans*, Illiger; and *Pulex irritans* var. *bahiensis*, var. n., on man.

GEORGE (L.). **A Report on an outbreak of Yellow Fever of an unusual nature at Brighton-La-Brea, Trinidad.**—*Trinidad and Tobago Council Paper No. 205 of 1914, Port-of-Spain,* 1915, pp. 12-18, 1 map, 10 charts.

Ten cases of yellow fever, divisible into four distinct groups, occurred at Brighton La-Brea, Trinidad, at the end of November and throughout December 1913, among white employees in the oil-fields. The relation of the groups of cases and the possibility of infection by mosquitos from one to the other is discussed. La Brea, with a black or coloured population of about 2,000, is stated to be "undescribably filthy, overcrowded and swarming with *Stegomyia*," but no cases occurred there; at Brighton, with a population of 50 whites, only 500 yards away, the 10 cases occurred. On the other side, and about the same distance away along the coast, is a coloured settlement of about 600 known as "Coon Town," where the conditions were better than at La Brea, though the place was swarming with *Stegomyia*, and yet there were no cases of yellow fever.

The possible causes of the outbreak are discussed at length and include: importation; local infection from cases too mild to be recognised; and an intermediate host, possibly monkeys. The importation theory had to be abandoned on investigation; and with regard to infection from the native population as unconscious carriers, it is suggested that (1) the presence of a number of non-immune white men, recently arrived in the tropics, might furnish an intensive medium for the growth of the parasite; (2) the disturbance and cutting down of large tracts of virgin forest might have caused migration of *Stegomyia* mosquitos, introducing them for the first time to a feed of human blood and, in the case of the natives, infected blood; or (3) the effects might be due to a heavy wet season. Against these arguments it may be said, in regard to this particular outbreak, that there had been non-immunes in the locality for many years; a considerable quantity of forest was being cut down for some years back; and heavy wet seasons are frequent. The third theory of origin, suggested by Dr. Andrew Balfour of the Wellcome Research Institute, that some vertebrate, other than man, especially monkeys, may also act as the host of the yellow fever parasite, awaits confirmation. There is an old saying amongst the natives of the island that when the monkeys die one may expect an outbreak of yellow fever.

Body temperature was found to be useless as a warning symptom, as nearly all the inhabitants of Coon Town were found to have a temperature about 100° F., and no cases were discovered there. The supposed screened bungalows of the whites at Brighton were far from mosquito-proof, and the author killed 8 or 10 *Stegomyia* every night in his bedroom in one of the best of them. The bush was cut down over 150 acres and the exposed ground found to be full of depressions and gullies containing stagnant water. Barrels of distillate oil, fitted with special spigots, were placed in position in some of the gullies so as to give a continuous drip, but the natives having stolen the spigots, spraying with oil was resorted to over a wide area, and in two or three weeks mosquitos became difficult to find in Brighton. The gauze screens of the bungalows were also repaired and made efficient. The forest appearing to be the focus of infection, all white non-immunes were recalled from the oil-fields, except one who contracted yellow fever and died; but as work in the fields was very active, either they would have to be abandoned at enormous financial loss, or the forest had to be rendered safe. The following measures were therefore taken:—(1) no non-immune was allowed to go out for a period of five weeks since the last case was infected there; (2) clearing the forest for 100 feet on each side of the main road running through the oil-fields; this road was about five miles long; (3) clearing the forest for a radius of 900 feet from the centre of each well or field; (4) burning the bush, where possible, and draining the area thus exposed; (5) building screened barracks for the black employees.

Subsequently the non-immunes were allowed to return, a few at a time, protected by mosquito-proof helmets, gloves and leggings, and gradually work was resumed at full pressure and no more cases occurred. Active anti-mosquito measures were also taken at La Brea.

CLARE (H. L.). **Malaria.**—*Trinidad and Tobago Council Paper No. 205 of 1914, Port-of-Spain,* 1915, p. 9.

The spleen figure of the islands is given at 17·91 per cent. of children of 15 years and under, as against 34·05 in Ceylon and 34·1 in Mauritius. A mosquito survey is in progress and large collections of mosquitos are being accumulated; these will serve as the basis for an organised campaign against malaria.

Flea destruction as a plague measure.—*Indian Med. Gaz., Calcutta,* l, no. 3, March 1915, pp. 104–105.

Lt.-Col. D. T. Lane, Chief Plague Medical Officer of the Punjab, has stated that numerous experiments at the Malaria Bureau, Lahore, prove beyond doubt, that cresol vapour is extremely poisonous to fleas, though harmless to man and animals. Two ounces of cresol vaporised in a room with closed windows and doors kills the fleas in the room. The cresol used is saponified cresol issued by the Medical Store Depot at 2*s*. per gallon. There are two methods of using the vapour. (1) Kindle a small cow-dung fire, made of 4 or 5 cow-dung cakes, in a wide iron cup or *gumla* till it is smouldering well, but not in flame. Place the cup in the room with the doors and windows closed and pour 2 oz. of cresol on it and let it smoulder till completely burned. This takes about 2 hours. (2) Close the doors and windows of the room, place an *angiti* containing a fire of any material, provided the fire is not in flame, in any convenient part of the room and put a cup containing 2 oz. of cresol on the *angiti* and let it vaporise, which it does in about an hour. Either of these methods kills the fleas in a room. Care must be taken that the cresol is vaporised and not ignited. If poured on a flaming fire, cresol ignites and burns with a dense black smoke which is absolutely harmless to fleas. If correctly used, there is no flame, but a greyish vapour which is highly poisonous to fleas, though not offensive or injurious to man or domestic animals. The room should be kept closed until the vapour disappears, which it does in 2 to 3 hours. The work can be tested by placing control fleas in various parts of the room in gauze bags.

HOWARD (L. O.). **Report of the Entomologist for the year ended 30th June 1914.**—*Ann. Rept. U.S. Dept. Agric., Washington, D.C.*, 1914. [Reprint, 16 pp., received 1st March 1915.]

In this Report [see this *Review*, Ser. A, iii, p. 330] it is stated that the investigation of insects affecting the health of man and animals consisted of studies of malaria prophylaxis, control of house-flies in manure, eradication of the Rocky Mountain spotted-fever tick, the possible rôle of insects in the transmission of pellagra, tick life-histories, and studies of insects affecting live-stock. In the course of important work undertaken by the Bureau with the object of obtaining exact information on the relation of malaria to agriculture, on the bionomics of the mosquitos involved in the transmission of the disease, and on prophylactic measures from the standpoint of mosquito control, it was found that low efficiency due to malaria caused a reduction of about 15 per cent. of the acreage that could otherwise have been cultivated. The present loss through malaria in the Southern States therefore amounts to many millions of dollars. The investigation revealed the fact that under boll-weevil conditions, the loss of time and the decreased efficiency become very serious throughout the season, for failure to keep up the cultivation of the crop or to plant at the proper time, gives the weevil a decided advantage. The investigation of flies, the larvae of which attack domestic animals, was carried on. Another investigation was concerned with the spread of anthrax by biting flies. The warble flies, *Hypoderma bovis* and *H. lineata*, and the cattle tick were also the subject of study. Through the kindness of Dr. Brumpt of Paris two shipments were received of ticks infested by a parasite common in France. Dr. Brumpt has pointed out the feasibility of utilising it against the spotted-fever tick of the United States.

COOLEY (R. A.). **Twelfth Annual Report of the State Entomologist of Montana.**—*Mta. Agric. Expt. Sta., Bozeman*, Bull. no. 102, December 1914, pp. 197–208. [Received 6th April 1915.]

In the course of his report on insect pests in 1914 [see this *Review*, Ser. A, iii, pp. 334-335] the author says that several requests were received for information on the control of the bedbug, *Cimex lectularius*, L., one severe infestation of which was controlled by two fumigations with hydrocyanic-acid gas. *Gastrophilus haemorrhoidalis*, L. (lip bot-fly) is apparently spreading westwards through the State. *Simulium vittatus*, Zett., gorged with blood, was taken upon windows in the college horse barn. Undetermined SIMULIIDAE were taken upon horses in the Gallatin Mountains and in the Yellowstone Valley where they were reported to be so numerous that field-workers found it necessary to wear veils.

Lack of funds prevented any extensive operations against mosquitos, but there are localities where mosquitos are so abundant that it is out of the question to till the soil without having the face, neck, and hands completely protected. In some places stock is injured and farming operations seriously impeded. Malarial mosquitos were found in two valleys, making a total of three localities in Montana where these insects have been found.

Ealand (C. A.). **Insects and Man.**—London: Grant Richards, Ltd., 1915, 343 pp., 16 pls., 100 figs., 8vo. Price 12*s*.

This book does not claim to be more than a compilation, but it is well arranged and though dealing with highly technical matters, is presented in an attractive form. The relations of insects with plants and the parasites of man and domestic animals are dealt with, and a lengthy section deals with insect control.

Under insects as carriers of the organisms of human diseases, the mosquito and the tsetse-fly naturally occupy an important place, as also do ticks, fleas and other blood-suckers. A clear statement of the parts played by them in conveying malaria, sleeping sickness, relapsing fever, verruga, plague, etc., is given. The loss to owners of live-stock from tick fever, piroplasmosis, mal de caderas, warbles and other insect-borne diseases, is emphasised, and it is perhaps not realised that the ox warble fly, *Hypoderma bovis*, causes losses which have been estimated at from two to seven millions sterling per annum in England alone. Great pains have been taken to give historical details, especially in the chapters on insect-borne diseases of man and animals. The history of plague and its relation to rats and fleas though brief, is a good example of this. The historical account of plague in England might have been a little enlarged with advantage, if only to emphasise the fact that the "great plague" of 1665 was only the last great outburst of a disease which had been endemic at least since 1349, and there is no reference to Boccacio's vivid account of the plague at Florence. The illustrations are well chosen, especially those from photographs. The one defect in an otherwise most excellent and useful book is the index. Ten pages of bibliography with references to over 200 works are appended.

Suhr (A. C. H.). **A note on Fevers Resembling Sand-Fly Fever at Singapore.**—*Jl. R. Army Med. Corps, London*, xxiv, no. 1, January 1915, pp. 49–51.

Febrile cases bearing a marked resemblance to *Phlebotomus* fever as seen in Malta, are common in Singapore and a few weeks' experience sufficed to show that these were not cases of malaria as generally supposed. Absence of parasites in the blood is not infrequently observed in febrile attacks occurring in old cases of malaria and these must not be confused with the type of fever under consideration. The patients examined were all men who had arrived direct from England in 1912, the majority of them having never been exposed to malarial infection, and the observations only apply to a certain number stationed on an island, Pulan Brani, which is almost free from malaria. Their blood contained no parasite and their temperature charts in no way resembled those of ague, the general symptoms being indistinguishable from those of sand-fly fever as seen in Malta. The author saw some cases which he had no hesitation in diagnosing as dengue, though the local medical authorities differ greatly as to the presence and frequency of this disease in Singapore. Numbers of flies resembling sand-flies were caught, but not one proved to be a *Phlebotomus*. Attempts were made to breed them from earth and debris likely to harbour them, but without success. The author was constantly bitten by small flies, not *Phlebotomus*, on still evenings on Blakan Mati, an island twice as far from the main island of Singapore as Pulan Brani. Both islands are covered with tropical vegetation and are the exact antithesis of Malta.

Specification of labour and material required in the construction of a shower spray for the treatment of 250 sheep per hour, as recommended by the Department of Agriculture and Stock.—*Queensland Agric. Jl., Brisbane,* iii, no. 1, January 1915, pp. 14–15, 1 diagram.

Full constructional details are given, with a diagram showing the plan, section and elevation of the shower-spray.

Cory (A. H.). **The sheep blow-fly.**—*Queensland Agric. Jl., Brisbane,* iii, no. 1, January 1915, pp. 15–17.

In dipping experiments at Gindie State Farm, 10 batches of 50 sheep each were dipped in 10 different dipping baths and 145 untreated sheep were kept as controls. Of the latter, 5 died from causes unconnected with flies, while 9 of the treated animals broke into neighbouring paddocks and were lost. The remaining 631 sheep were examined, and it was found that 167 were blown, being 92 of the 491 dipped ones and 75 of the 140 undipped ones. These figures work out at 26·44, 18·73, and 53·67 per cent. respectively, and it would therefore, appear that dipping affords some protection. The flies appeared to do serious harm only when the ewes began to lamb. It will be necessary to repeat the experiments, as the period from April to June 1914 was exceedingly dry and the flies did not, in consequence, appear until later.

Gordon (P. R.). **Can the cattle tick be exterminated in Queensland?**—*Queensland Agric. Jl., Brisbane,* iii, no. 1, January 1915, pp. 24–26.

In 1863, the outbreak of sheep scab in New South Wales caused the passing of a Quarantine Act. The disease was completely stamped out in 18 months and the Colony was proclaimed clean in 1866. The author considers that success was due to the determined insistence with which all the provisions of the law were carried out. The tobacco and sulphur dip was found to be the most reliable then available. It was adopted as the Government dip and the use of all other specifics was strictly prohibited. The tobacco infusion destroyed the Acari, while the sulphur prevented reinfestation for a period of six months, by which time all parasites on trees, fences, etc., had died off. Two dippings, within an interval of from fourteen to twenty days, were found necessary, as many of the parasites were in a state of partial development under the skin at the time of the first dipping. Proprietary dips were not even allowed a trial, one reason being that their composition was not made public. In any attempt to stamp out the cattle tick in Queensland, a means of preventing reinfestation must, as with sheep scab, be of the very first importance. Even so, it is a question whether extermination can be attained until all large grazing holdings have been subdivided into smaller properties and all cattle compulsorily kept within fences. All proprietary dips for cattle ticks should be prohibited, and only the Government dip allowed, unless the ingredients of those dips be fully described to the Analyst of the Department of Agriculture.

Woodward (T. E.) & Turner (W. F.). **The effect of the cattle tick upon the milk production of dairy cows.**—*U.S. Dept. Agric. Washington, D.C.*, Bull. no. 147, 16th January 1915, 22 pp., 4 figs., 2 charts.

Experiments were conducted to ascertain the effect of *Margaropus annulatus* (the common cattle tick) on the milk production and body weights of dairy cows [see this *Review*, Ser. B, iii, p. 58]. The tick has a decidedly injurious effect upon supposedly immune dairy cattle. When sufficient food is given, the milk production suffers more than the body weight. Tick-free and tick-infested groups gave practically the same amounts of milk at the beginning of the tests ; at the close, the infested gave only 65·8 per cent., as against 100 per cent. from the tick-free. The latter gained 6·1 per cent. in body weight, while the former only gained 3·6 per cent. Spraying or dipping tick-free animals causes a marked, though temporary, decrease in milk flow. In this experiment, there was an average reduction of 6·1 per cent. from the normal flow for a period of five days following each of the four applications of the arsenical solution. The resistance of cattle to infestation by the tick is variable. Of the 10 animals in the infested group, 4 became heavily infested, 2 more so than the average, and the remaining 4 but lightly. The death of one of the best cows in the infested group emphasises the extreme hazard of continuous infestation ; this animal represented at least 10 per cent. of the capital invested in the infested group.

Rucker (W. C.). **Bubonic Plague : A Menace to American Seaports.**—*Public Health Repts., Washington, D.C.*, xxx, no. 16, pp. 1140–1146, 1 chart.

Plague is essentially a ship-borne disease, but the fumigation of ships is a costly measure, and if omitted on a single occasion, the introduction of infected rodents may result. The only sure protection lies in adequate rat proofing, which should begin at the water front if it is to be effective. This is an economic as well as a public health measure, as every case of human plague in a community costs at least £1,500 and every case of rodent plague at least £1,000. The enormous losses due to quarantine and diversion of commerce cannot be estimated.

Reports to the Local Government Board on Public Health and Medical Subjects, N.S., no. 102, *London*, 1914, 32 pp. Price 6*d*.

The above contains the following "Further Reports on Flies as Carriers of Infection":—

Monckton Copeman (S.) & Austen (E. E.). i. **Do House-Flies Hibernate?** pp. 6–26.

Investigations in the spring of 1913 lent no support to the commonly received opinion that house-flies hibernate as adults. Dr. H. Skinner [see this *Review*, Ser. B, i, p. 146] definitely rejected the idea as the result of observations, the earliest flies caught having all the appearances and characters of newly emerged imagines, and he expressed the opinion that house-flies pass the winter as pupae and in no other way. The authors considered these deductions unsatisfactory because, firstly, the "house-flies" were not definitely identified as *Musca domestica*, and secondly, the winter of Philadelphia is cold and the conditions are not the same as in England and elsewhere. In order to obtain definite information, the authors published a circular in certain journals asking for specimens to be sent to them from as many different sources as possible. Between 19th January and 27th April 1914, 58 consignments were received from all parts of England, none being sent from Scotland, Ireland or Wales. The specimens sent comprised :—*Pollenia rudis*, F., 27 ; *Muscina stabulans*, Fln., 14 ; *Musca domestica*, L., 12 ; *Pyrellia eriophthalma*, Macq., 12 ; *Musca corvina*, F., 9 ; *Limnophora septemnotata*, Ztt., 6 ; *Calliphora erythrocephala*, Mg., 3 ; *Fannia canicularis*, L., 3 ; *Phaonia signata*, Mg., 2 ; *Phorbia muscaria*, Mg., 1 ; *Muscina pabulorum*, Fln., 1 ; *Chloropisca notata*, Mg., 1 ; *Blepharoptera serrata*, L., 1 ; *Tephrochlamis canescens*, Mg., 1. The notes as to the conditions under which they were found afford no support to the belief that house-flies hibernate in this country in the adult state. The few specimens of *Musca domestica* sent in were all taken in an active condition ; some of the other flies, however, such as the extremely common *Pollenia rudis*, F., were often found partially dormant. It is difficult to resist the conclusion that, did the house-fly really hibernate in the adult state, some evidence of the fact must have been obtained. The idea suggests itself that the relative lateness of the season at which house-flies annually become abundant may be due to the smallness of the number of individuals that, in an active condition, survive the winter in houses and other buildings, although it must be admitted that there is as yet nothing in the shape of proof that female house-flies found alive at the end of winter actually survive until oviposition takes place. The suggestion here made is not necessarily invalidated by the apparent discrepancy provided by the case of the lesser house-fly (*Fannia canicularis*, L.), which contrives to establish itself in some numbers in houses considerably earlier in the year than *Musca domestica*, although in the case of this species also there is no evidence that it hibernates there. The preliminary stages of the two species mentioned are very different and it by no means follows that the winter is passed in both cases, in the same stage. The numbers of the sexes of the 12 specimens of *Musca domestica* were equal.

BERNSTEIN (J. M.). ii. **The Destruction of Flies by means of Bacterial Cultures,** pp. 27–31.

Hesse's experiments on *Mucor racemosus* which constantly resulted from attempts to cultivate *Empusa muscae* led him to try the former upon flies. He met with success both on captured and on bred flies, and polymorphism of these two fungi therefore suggested itself. Further and careful experiments only resulted in the constant production of *Mucor racemosus*. The author cultivated the fungus by Hesse's method on slices of yolk of egg sterilised at 100° C. from flies dead of *Empusa muscae* and made a series of experiments with it. All his flies, bred from insects in confinement, died of *Empusa muscae* and repeated cultures from the dead flies yielded only *Mucor racemosus.* To remove the difficulty that the food supplied might have only stimulated the growth of *Empusa* spores already dormant in the bodies of the flies, two groups of flies were fed on syrup containing spores of *Mucor hiemalis* and *Mucor racemosus* respectively, and all died with the usual signs of *Empusa muscae* as the cause. The controls lived on and died naturally without exhibiting any such signs. Hesse's observations are thus confirmed. Trials have been made of fly-papers smeared with syrup infected with spores of *M. racemosus* and the impression was that a marked increase of fly mortality took place. Manure containing larvae was sprinkled with the same syrup and none of the larvae matured.

RAMSBOTTOM (J.). iii. **An Investigation of Mr. Hesse's Work on the supposed Relationship of** *Empusa muscae* **and** *Mucor racemosus,* pp. 31–32.

An account of the cultivation of spores of *Empusa muscae* is given and it is stated that, so far as these preliminary observations go, they show that a single *Empusa* spore, on germination, has never given rise to the mycelium, or eventually the fruit of *Mucor racemosus* ; that where such have occurred in a culture, the mycelium could usually be traced to a cluster of spores which might easily have had the smaller spores of *Mucor* in their midst. *Penicillium* and *Eurotium* occurred in one or two cases, but the almost invariable appearance of *Mucor racemosus* in most of the hanging-drops calls for further investigation.

HEWITT (C. Gordon). **Observations on the Feeding Habits of the Stable Fly,** *Stomoxys calcitrans,* **L.**—*Trans. R. Soc. Canada, Ottawa,* (3), viii, September 1914, pp. 37–42, 1 pl. [Received 3rd June 1915.]

These observations, though incomplete, are published because any addition to our knowledge of the habits of *Stomoxys calcitrans* is useful at the present time. Reference is made to the work of Bishopp, Mitzmain and Portchinsky [see this *Review*, Ser. B, i, pp. 96, 113, 129 and 146–148]. Both sexes feed readily either on man or on guinea-pigs, but the author found that feeding will not begin till at least 24 hours after emergence from the pupa, whereas Mitzmain found this period to be 6–8 hours (in the Philippines). The processes of insertion of the proboscis into the skin and of sucking the blood of the host are described in detail. Flies fed on an average for 8 or 9 minutes. The abdomen of the fully gorged fly is not only more than twice its usual depth but half as broad again as the normal. In some cases, after resting half an hour, the abdomen is again reduced to the normal size ; digested blood first appeared in the faeces in about 6¼ hours, the average time required for digestion being 72½ hours. These and other similar data are set out in a table. Under the microscope the faeces were found to contain haemoglobin crystals, and remains of leucocytes ; no bacteria were found. The interval between meals is difficult to determine, but the flies usually feed readily 48 hours after the last meal ; one fly was very active in the laboratory 125 hours after feeding, the previous meal having taken 72 hours to digest, and it is probable that with access to moisture, which they absorb readily, they will live many days without food.

FRANCIS (M.). **The Cattle Tick.**—*Seventeenth Texas Farmers' Congress, 1914, Texas Dept. Agric., Austin,* Bull. 40, November-December 1914, pp. 76–78. [Received 10th May 1915.]

The cattle tick, *Margaropus annulatus,* occurs in torrid and subtorrid zones having a low altitude and has been reported from the United States, Mexico, South America, Asia, Africa and Australia. The loss caused by it, which in the United States alone amounts to one hundred million dollars annually, results from the actual deaths from Texas fever in native and imported animals, the stunting of growth in those which survive, damage to hides from tick bites, and the restrictions to trade and transportation of animals to the most suitable feeding grounds. Regions infested by the parasites are especially adapted to the economic production of beef and dairy products, so that the tick becomes a serious factor in the cost of living. A description of the life-history of the tick is given. An efficient method of killing the ticks consists of forcing the cattle to swim through a vat containing a solution of arsenic; the dipping must be repeated periodically if the animals return to an infected pasture.

Report of the Chief of the Veterinary Department for the year 1913.—*Boletim da Repartição de Agricultura, Lourenço Marques,* nos. 19–21, October–December 1914, pp. 230 & 256.

Four ticks are recorded, apparently new to Mozambique. They have been identified by Dr. Nuttall as *Rhipicephalus falcatus, R. maculatus* from pigs, *R. pulchellus* from a mule, and *R. neavei* from a bush-buck. Theileriasis (East Coast fever) is reported as very prevalent and causing great loss, and attempts have been made to extend the use of dipping tanks, but with no great success. Cases of trypanosomiasis in cattle having been detected on two farms, search was made for *Glossina,* but none could be found, and transmission by some other insect is suspected.

BANKS (C. S.). **A New Philippine Malaria Mosquito.**—*Philippine Jl. Sci., Manila,* Sec. D, ix, no. 4, August 1914, pp. 405–407. [Received 17th May 1915.]

Detailed descriptions of both male and female of *Myzomyia febrifera* are given in this paper. This species has been ascertained by Drs. Walker and Barber [see this *Review,* Ser. B, iii, p. 65] to be capable of transmitting malaria.

[As stated on p. 65, this species has already been described by Theobald as *Anopheles minutus* and the name here proposed cannot stand.—Ed.]

Barber (B. L.). **Report of the Animal Husbandman.**—*Rept. Guam Agric. Expt. Sta., 1914, Washington, D.C.*, 26th February 1915, pp. 18–27, 3 plates, 6 figs.

The immunisation of susceptible cattle from the United States for controlling tick infestation has not proved complete or reliable, but results in what appears to be a chronic form of the disease. In the introduction of cattle into Guam, the great importance of securing immune stock is plainly recognised. The daily temperature records of the imported stock have been kept, and these aid greatly in the detection of the disease in its incipient form. Temperature charts have been compiled from these records and are submitted with this report.

Bishopp (F. C.), Dove (W. E.), Parman (D. C.). U.S. Bur. Entom. **Notes on certain points of Economic Importance in the Biology of the House Fly.**—*Jl. Econ. Entom., Concord*, viii, no. 1, February 1915, pp. 54–71.

Certain points as yet undetermined in the life-history and habits of the house-fly, *Musca domestica*, were investigated by the authors: these included the determination of the duration of different developmental stages of the insect, the longevity of the adult, the number of ovipositions and the interval between each, the effect of humidity and temperature on the several stages. The period between emergence and copulation varies from 1–18 days; variation also occurs in the period between the date of copulation and the beginning of oviposition, a range of 2–3 days having been observed. The desire to mate seems to be influenced by the food of the adult; copulation was not observed in unfed adults. Previous observers have found a period of 10–14 days to elapse between the emergence of the adult from the pupa and the first egg deposited. In this series of experiments, test cages varying in size from one cubic foot to 10 feet square by 6 feet high were placed in different situations. Freshly emerged flies, in numbers ranging from one pair to several hundreds, were used; different kinds of food and breeding media were supplied. The shortest period observed was four days, the longest 20 days, the mean temperatures being 87·5° F. and 68·1° F. respectively. In autumn, the period was not less than 10 days. Food supply is an important factor, a variety of food decreasing the time before egg laying. Humidity hastens egg-laying; sunshine, apart from higher temperature, seems to have a stimulating effect on reproduction. From the above experiments, it appears necessary, in Texas, to destroy female flies within four days after emergence in summer and within 10 days in autumn and early spring, in order to prevent reproduction. The shortness of the pre-oviposition period emphasises the importance of dealing with breeding media rather than the destruction of adults. This is especially the case in the tropics, where the period is brief, successive depositions are frequent and longevity of the adult reduced. The total time between the beginning and end of oviposition is short, the adults often living several days after the last eggs are deposited. Usually, two batches are deposited with an interval of about eight days between them. The observers noticed a marked tendency to the clustering of eggs in one place on manure piles. This habit of association continued to some extent in the larval stage, though it was probably dependent on suitable feeding places. Numbers of larvae were observed to pupate in one place, probably that which offered the least resistance in migrating and which furnished proper protection and moisture. The total period from the deposition of eggs to the emergence of the adult varied from 8–51 days ; a much longer time was observed in the hibernation experiments at Dallas and Uvalde, Texas. During the coldest weather, development was completely arrested. The incubation period of the eggs was in almost all cases less than 24 hours ; the time of emergence of the larva was hastened by increase in temperature. The larval stages lasted from three days to about three weeks, the usual time being 4–7 days. Temperature, character and amount of breeding medium were important factors. In large piles of manure, it was observed that the larvae governed their temperature conditions by penetrating further into the manure during cold weather and remaining nearer the surface when the weather was warm. The pupal stage ranged from 3–26 days. The influence of temperature is more marked in this stage than in the previous one, since the pupae are usually more removed from the heat of the manure, and have no way of accommodating themselves to changes of temperature. Horse manure is a very favourable breeding medium ; manure of the chicken, pig, goat and cow are also suitable. Decaying vegetable matter affords important breeding places, especially in the neighbourhood of towns. In the grain belt of Texas, Oklahoma, and the States to the north, the rotted bases of oat or wheat straw stacks were found in some cases to breed many house-flies ; fermenting cotton-seed husks mixed with bran, etc., in the bottom of feed boxes produced very large numbers. In experiments conducted in England, Dr. Hewitt found it possible to keep house-flies alive for seven weeks in summer. Dr. Griffith, also in England, had one fly live for 16 weeks. In the experiments at Dallas, the maximum period was 53 days. The longevity was greatly reduced when food was not given. During summer, when supplied with abundance of food and breeding material, the usual period was 2–4 weeks ; cold weather prolonged the life of the adults, correspondingly delaying reproduction. It has been assumed that the winter is passed in the adult stage only ; evidence for this belief has been drawn from the fact that flies dissected in autumn had much fat stored up, while in spring this was absent. Adults have been found in dormant, semi-dormant and active states in mid-winter, and those emerging late in the autumn show greater longevity. The experiments at Dallas show that the winter can be passed in immature stages ; moreover, no adults under observation survived the winter. Results indicated that flies kept at a temperature not low enough to render them inactive either oviposited very soon or died. The chances of adults finding shelter from destruction by cold seem, in the opinion of the authors, very small indeed ; although some individuals may hibernate in this way, the species is dependent on those individuals which pass the winter in the immature stages, or those which continue to breed through the winter. Experiments were carried on at Dallas during the winter 1913–14 to determine the ability of adults to pass the winter. The fungus, *Empusa muscae*, caused the death of large numbers ; frequent observations during winter and spring failed to show any living flies in the shelter provided. Similar experiments were conducted at Uvalde, Texas. Here, from 18th December 1913 to 3rd January 1914, feeding and copulation proceeded ; on January 20th, 64 adults were found benumbed by cold outside the hibernation material. None of these revived. On 27th January, a number were active during the warm part of the day ; on 28th January, the last two adults were seen. No living flies were found on an examination of the hibernation material after this date. Where artificial heat was applied the greatest possible longevity was 53 days. In two instances, larval and pupal stages were carried through the winter, from 26th November 1913 to 26th May 1914, when adults were observed in the cage. The latter had been placed in partial shade and had been subject to inundation during the winter ; these facts probably account for the late appearance of the adults. Larvae were found until 21st March, but would probably have pupated earlier if the manure heap had generated sufficient heat. The lowest temperature recorded during this period was 23° F. Similar tests at Uvalde yielded results agreeing with those above. Examinations of chicken manure in poultry houses in mid-winter, demonstrated the presence of considerable numbers of larvae ; in such situations the cold is not excessive, though not warm enough to cause the emergence of the adult. Stables furnish somewhat similar conditions. Destruction of immature stages in winter is therefore of much importance in control ; this may easily be accomplished by thoroughly cleaning out stables, chicken-houses, etc., and scattering the manure thinly over fields. Accumulations of breeding media should be destroyed.

HEADLEE (T. J.). **The Control of Mosquitoes in a limited locality.**—*Jl. Econ. Entom.*, *Concord*, viii, no. 1, February 1915, pp. 40–47.

For the past three years, two counties in New Jersey have been trying to control the mosquitos within their limits ; for two years, two other counties have been engaged in similar work. Three of these counties are sufficiently alike in internal and external conditions to render valuable a comparison of their methods and results. They are referred to as A, B, and C. A description of the geographical conditions and the population of each of the three counties is given ; an area of salt marsh is present in each ; with one exception, an effort has been made to drain all these marshes. The work of control is divided into administration, inspection, and elimination. Under the head of administration are included the expenses of the commissioners, the salary and expenses of the inspector and his deputies and of the necessary clerical staff. Inspection includes all work done to find the breeding places of mosquitos, and involves the examination of the entire territory every two weeks throughout the 4–5 months' breeding season. In B and C, a certain territory is assigned to an inspector who is held responsible for its condition ; in A, a district is assigned to one inspector and a number of subordinates are given him. Under the term elimination are included all those operations of draining, filling, oiling, cleaning and stocking with fish that are necessary for the removal of breeding places. There is much variation in the amount and kind of equipment used by the different organisations. Education comprises the publication of pamphlets, of newspaper articles, the giving of lectures, and the preparation of exhibits.

Mosquito control in any area within reach of a salt marsh depends on the prevention of breeding on that marsh. Drainage has not eliminated all the breeding, but has brought it within control. The writer believes that frequent and regular night collections of mosquitos on the wing should be made throughout the breeding season. The cost of control in the three counties is given ; the cost on the upland increases per unit area as the population grows denser, but the per capita cost decreases as the density of population increases. The results of control appear in increased comfort and health and in increase in property values. A census taken by the writer has shown that the large majority of the population of the counties is in favour of the continuance of the work.

COOLEY (R. A.). **The Spotted Fever Tick (*Dermacentor venustus*, Banks) and its Control in the Bitter Root Valley, Montana.**—*Jl. Econ. Entom., Concord*, viii, no. 1, February 1915, pp. 47–54.

The paper presents a summary of our knowledge of the spotted fever tick, *Dermacentor venustus*, and outlines the control work now in progress. This tick is the carrier of Rocky Mountain spotted fever, and is responsible for " tick paralysis " in man and certain domestic animals. It has been recorded in Washington, Oregon, Idaho, Montana, Wyoming, Utah, Colorada, California, and extends northward into British Columbia. The larvae and nymphs occur on practically all the small mammals in the valley, especially the ground squirrel (*Citellus columbianus*), the pine squirrel (*Sciurus hudsonicus richardsoni*) and the chipmunk (*Eutanias luteiventris*). The adults feed chiefly on horses and cows. Consequently, ticks practically disappear when the limit of the range of domestic animals is reached. Beyond this, in the natural habitat of the Rocky Mountain Goat, the tick is exceedingly abundant. Outside the goat ranges, the numbers are insignificant, except in the mountains near Victor. These facts have an important bearing on eradication ; domestic animals can be controlled by dipping or other means. If the species is prevented from laying eggs, the tick must disappear, and the disease with it. The life-cycle continues over two years at least ; if the adult fails to secure a host during the first season which follows nymphal feeding, it can pass into the ground in July and reappear next year, thus making the cycle three years. The following methods of control may be used :—(1) The destruction of the ticks before egg-laying by the use of arsenical dip ; this method has been found very effective and, in future, will probably have a wider application ; (2) the destruction of rodents, especially the ground squirrels, as they are largely responsible for maintaining a food supply for the ticks. Since, however, the early stages feed on other animals, other means will eventually be needed. Grazing sheep over tick-infested country may be useful, since many adults are killed in the wool.

The work of control is conducted by the Montana State Board of Entomology, the United States Bureau of Entomology and the United States Public Health Service. The State Board was created in 1913 and has authority to enforce regulations for the eradication of the spotted fever tick ; the two federal services are engaged in work in Bitter Root valley, and are subject to the State Board. There is no doubt that control measures have already saved a considerable number of lives; although the population of the valley is increasing and the disease itself is slowly spreading, fewer cases have occurred in recent years. Complete control will require some years, since the territory involved is extensive and methods effective in one district are less useful in another. Educational work among the people must be in advance of actual control, and the life-history of the tick is such that thoroughly effective measures must be pursued through a term of years. In the discussion following the paper, Professor Cooley stated that the tick was responsible for paralysis in sheep, and in view of the recent work by Hadwen and Nuttall there should be no hesitation in calling this a definite disease. [See also this *Review*, Ser. B, iii, pp. 60 & 62.]

FERNANDES (J.). **Phthiriase**—*Boletim da Repartição de Agricultura, Lourenço Marques*, nos. 19–21, October-December 1914, pp. 278–280. [Received 15th May 1915.]

In Mozambique if cattle are neglected they become infested with lice, and though death is rare, the animals are usually in poor condition. The following species are noted as occurring: On horses and mules: *Haematopinus asini* (*macrocephalus*), *Trichodectes pilosus*, *Trichodectes pubescens* and *T. parumpilosus*. On cattle: *Haematopinus eurysternus* and *Linognathus vituli* (*H. tenuirostris*), *Trichodectes scalaris* and *T. bituberculatus*. On sheep: *Trichodectes sphaerocephalus*. On goats: *Haematopinus stenopsis* and *Trichodectes climax*. On pigs: *Haematopinus suis* (*urius*). On dogs: *Haematopinus piliferus* and *Trichodectes latus*. On cats: *Trichodectes subrostratus*. The best known are those which attack pigs and the usual mode of transmission is by actual contact. Prevention is the best treatment and the adoption of all possible means of securing cleanliness in the animals themselves and their surroundings. The best general remedy is a decoction of tobacco leaves, about 3 oz. well boiled in a quart of water and the liquor well pressed out of the leaves. For sheep, benzine 1 part, soft soap 6 parts, water 20 parts; mix and wash the affected parts. Schleg's formula is composed of arsenious acid and potash, of each 16 grams, water and vinegar, of each 1½ litres; mix and dissolve. Viborg's formula is arsenious acid 32 grams, vinegar 2 litres, distilled water 1 litre, but the author prefers the benzine formula. While on a journey to the north, the author saw a herd of cattle with their necks perfectly white from the number of eggs on the hair and many of them so weak that they could hardly stand.

Mosquito Work in Connecticut in 1914.—*Rept. Connecticut Agric. Expt. Sta., 1914, New Haven*, 1915, pp. 181–183.

This report deals with the increased drainage work in Greenwich and Madison during the year and the corresponding decrease in malaria. In New Haven several old ditches have been cleaned and new ones cut. Measures have been taken for the cleansing of West River, which has hitherto furnished a breeding place for *Culex pipiens*.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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Leeward Islands. Despatch of the Governor, Sir H. Hesketh Bell, to the Colonial Office. [Received 3rd May 1915.]

In an enclosure to this despatch, Dr. J. C. McPherson, the Senior Medical Officer of Montserrat, says that, though it has often been reported that no *Anopheles* existed in the island which might act as malaria-carriers, specimens of *Anopheles* (*Cellia*) *argyrotarsis* have been found at Elberton, and that it is of interest to note that fever, possibly of malarial origin, was said at one time to be very common in this region.

ROUBAUD (E.). **Hématophagie larvaire et affinités parasitaires d'une mouche Calliphorine, *Phormia sordida*, Meig., parasite des jeunes oiseaux.** [Larval bloodsucking habits and parasitic affinities of the Calliphorine fly, *Phormia sordida*, Meig., a parasite of young birds.]—*Bull. Soc. Path. Exot.*, *Paris*, viii, no. 2, 10th February 1915, pp. 77–79.

In 1844 Dufour observed that the larvae of *Phormia azurea*, Meig. (=*sordida*, Zett.), developed in swallows' nests, and that their digestive tube contained a red substance resembling blood. During the past summer M. H. Du Buysson sent to the author a number of these larvae taken in Allier (France) from the nest of the great titmouse, *Parus major*, the presence of blood in the digestive tube of newly gorged individuals being indisputable. These larvae can only attack the skin of the host if pressed against it by some other body, such as the side of the nest. The quantity of blood ingested is similar to that sucked by *Auchmeromyia* larvae. The bite is rather painful to man, resembling that of the larvae of *Chaeromyia*. The parasitic adaptation of the larvae of *Phormia sordida* to young, featherless birds is more primitive in character, but otherwise completely analogous to that of African CALLIPHORINAE parasitic on man and on mammals having little hair.

KERANDEL (J.). **Insectivore réservoir de virus de la peste au Cambodge.** [An Insectivore as a reservoir of plague virus in Cambodia.]—*Bull. Soc. Path. Exot.*, *Paris*, viii, no. 2, 10th February 1915, pp. 54–57.

In October 1915, the body of a freshly dead shrew, *Crocidura murina*, L., was found at Pnôm-Penh, in the house of a Chinaman who had died of plague. A microscopic examination of the ganglia revealed numerous coccobacilli, morphologically identical with those of Yersin. They were also found in the liver and spleen and were about as plentiful in the blood as in a rat naturally infected with plague. A jelly, sown according to Veillon's method, produced a culture of bacilli indistinguishable from those of authentic plague. White mice and a guineapig were inoculated with these bacilli and succumbed to septicaemia and congestion. The author's recall to France, owing to the war, interrupted the experiments, but it would appear that *C. murina* plays a rôle in plague dissemination similar to that of rats. *Xenopsylla cheopis*, Rothschild, was found on three of these shrews in even larger proportions than on rats captured in the same locality.

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Roubaud (E.). **Etudes sur la Faune Parasitaire de l'Afrique Occidentale Française.—Premier Fascicule : Les Producteurs de Myiases et Agents similaires chez l'homme et les animaux.** [Studies of the parasitic fauna of French West Africa. Part I. The producers of myiasis and similar disorders in man and animals.] Paris : Masson & Co., 1914, 251 pp., 4 col. pls., 70 figs.

This is an account of the investigations by MM. Roubaud and Bouet into the insect-borne diseases of French West Africa. The first chapter deals with the troubles caused by various Muscid larvae, *Sarcophaga*, *Wohlfartia*, *Lucilia*, *Pycnosoma*, etc. The last-named genus, more especially *P. putorium*, is believed to be largely concerned in the spread of amoebic dysentery. In dealing with the specific myiases of Bovidae and Equidae, Rovere's account of the larva of *Pycnosoma* (*Chrysomyia*) *megacephala* is given at length. At the vaccine station at Bouaké, the larvae of what is believed to have been this species have caused serious losses among the heifers. Dr. Villeneuve is of opinion that both Rovere's specimens and the authors' belong to a new species which he has named *Pycnosoma* (*Chrysomyia*) *bezziana* and further that *P. megacephala*, recorded by Wiedemann from Guinea, is synonymons with *P. dux*, Esch., and came from China. The insect is described and figured.

Lucilia argyrocephala, Macq., is described as producing myiasis in Africa, and attacks existing sores and ulcers in man, dogs, camels and other animals. The author never found *L. sericata* developing on wounds in West Africa, but it is probable that both species breed in dead carcases. The various species of *Auchmeromyia* are dealt with in great detail, and they are said to be parasitic only on nearly hairless mammals, such as man, *Phacochaerus* and *Orycteropus*, their structure being such that adhesion to the skin of an animal covered with hair is impossible. *A. luteola* is exclusively a parasite of man, while the species of *Choeromyia* attack only the other animals named.

The life-history of *Cordylobia anthropophaga* is given at length and the process of oviposition is described ; 150 eggs were laid on the walls of a glass vessel, and on some rotten fruit lying on moist earth at the bottom, the fly dying the following day. Experiments with the eggs were made : 71 of them were deposited on the skin of two dogs, a guinea-pig and a monkey and in no case were any of the animals attacked ; a guinea-pig was made to swallow 12 of the eggs without any result ; 15 larvae, just hatched, were placed on the surface of sand in a large glass vessel with a guinea-pig, which was removed 20 hours later and placed in a cage ; three days later, the characteristic tumours were found on the ventral surface of the body, the muzzle and the anus. These experiments are regarded as clearly proving the mode of infection, viz. by larvae which have hatched apart from the host. Further attempts to induce infection by introducing the larvae under the eyelids, into the nostrils, mouth, anus, etc. of a dog, failed. The infection of man by the "ver du Cayor", as this species is called in West Africa, is regarded as more or less accidental, and no positive example of infection of horses, sheep, oxen or pigs is known and it is rare in goats ; poultry, which would appear to be peculiarly exposed, are never attacked. The results of a number of experiments are given, which tend to show that the apparent choice of host is mainly a question of its body temperature. Rats are readily attacked; in guinea-pigs, the larvae almost always abort; in pigs, the development of the larvae was arrested in a day or two, and in fowls, it failed entirely. Larvae placed on fresh raw meat refuse to feed; in a dry atmosphere they may live for 10 or 11 days, if moist, barely 6 days. The larva, whether freshly emerged or 8–10 days old, penetrated the skin immediately, boring obliquely between the epidermis and the dermis, the process occupying about half an hour; once removed from the tumour the larva is incapable of repeating the operation. The first moult takes place in about three days after penetration and the total period of residence within the host is 7 to 8 days. Upon emerging, the larva falls to the ground and buries itself, remaining for 2 or 3 days without change, and consuming its reserves of food; it then pupates, the pupal stage never lasting more than 20 days. High temperature, such as 35° C. (95° F.), appears to be fatal.

Oestrus ovis, L., is very common in West Africa and causes great loss among sheep. The loss is apparently aggravated by the sudden fall of temperature at night, and it strongly advised that only those breeds of sheep which are more or less acclimatised, should be kept. The dust and dirt of the native stock-yards greatly increases the suffering of the animals. Oestrid larvae, probably those of *Rhinoestrus nasalis*, de Geer, are said to be frequently found in the frontal sinus in cattle in the abattoirs at Daka. *Cephalomyia maculata*, Wied., has been found in the pharynx of camels. Larvae, probably a species of *Rhinoestrus*, are occasionally found in the nasal fossae of horses in Senegal, and they have been found also in a duiker, *Cephalophus melanorheus*, Gray. The larvae of *Oestrus variolosus* are very common in the frontal sinuses of *Bubalis major*, Blyth. *Gedoelstia cristata*, in Lichtenstein's haartebeeste; *Kirkia surcoufi*, in *Bubalus major* and *Cobus defassa*; and *K. blanchardi*, are also mentioned [see this *Review*, Ser. B, ii, p. 91]. The following method of rearing Oestrid larvae is recommended; when taken from the head of a freshly killed animal, they are sorted into two lots, those which are uniformly white and those which show brown or black bands; the latter are in the third stage and near pupation. These are put into wide-mouthed bottles containing 2 or 3 inches of dry sand and the mouths closed with muslin. After an interval, varying from a few hours to one or two days, they bury themselves in the sand and pupate; the adults will emerge in about a month. Adult Oestrids cannot be induced to breed in cages, as they take no food and will not mate. The Oestrids which affect horses, mules and asses include a variety of *Gastrophila intestinalis*, which Brauer has named *G. asininus*; *G. nasalis*, L., which is fairly common, is found in the duodenum of horses, rarely in the stomach; it does not attach itself to the margin of the anus like *G. haemorroidalis*; it is probable that *G. flavipes* also occurs. Extreme cleanliness and the removal of ova and young larvae from the skin are the only preventive measures of any value. Elephants are attacked by two genera, *Pharyngobolus* and *Cobboldia*, the adult fly of the former being as yet unknown. Cobbold described the parasite of the Indian elephant as *Gastrophilus elephantis*, but Brauer, finding that the larvae had characters distinct from those of *Gastrophilus* placed them in a new genus *Cobboldia*, and Blanchard in 1893 discovered that those of the African elephant were not identical with those of the Indian; Brauer therefore reserves the name *C. elephantis*, Cobb., for the Indian species and has named the African form *C. elephantis africani* seu *loxodontis*, Brauer. Though warbled hides are only too numerous in West Africa, the author never succeeded in obtaining specimens of *Hypoderma lineata* and the identity of the species concerned is not known. *Neocuterebra squamosa*, a species allied to *Hypoderma*, described by Grünberg in 1906, attacks the foot of the African elephant.

The disease known as "larbish" or "oerbiss," linear myiasis, creeping disease, myiase rampante, etc., is common in Senegal, but no proof could be obtained of its insect origin and there appears to be sound reason for believing that oerbiss and the so-called myiase rampante are two distinct diseases. The history of the Guinea worm and its development in *Cyclops* is fully dealt with, and infection by direct transmission is considered an untenable hypothesis. It is remarkable that, while *Cyclops* may be found everywhere, Guinea worm is localised; the relation of the worm to local and climatic conditions is discussed. This book is an exhaustive treatise on the subject.

KURAOKA (H.). **Epidemiological Study of Plague in Formosa.**—*Far East. Assoc. Trop. Med., C. R. Trois. Congrès Biennal (1913), Saigon*, 1914, pp. 204–212, 7 tables.

In 1896, the year following the occupation of Formosa by Japan, plague broke out for the first time in the island and has since continued there, with a tendency to rage with great force every second or third year. The prevalence of human plague stands in close relationship with rat plague, and the number of human cases fluctuates in proportion to that of rat cases. The proportion is greater in Formosa than in either Osake or Kobe. This is probably due to the difference in sanitary ideas and of the style of dwelling houses. The principal species of rats responsible for the spread of plague are *M. rattus*, *M. decumanus* and *M. musculus*, and *Xenopsylla cheopis* is the flea particularly concerned. Though the carriage of plague from rat to man is largely effected by rat fleas, it is considered absurd to charge them with the whole responsibility; there must be quite a number of cases in which plague is contracted through wounds. The author believes that at least one-third of human cases are caused by contact with inorganic matter contaminated with the plague bacillus.

HOSTALRICH (—). **Un Foyer de Peste Bubonique en Annam.** [A Bubonic Plague Focus in Annam.]—*Far East. Assoc. Trop. Med., C. R. Trois. Congrès Biennal (1913), Saigon*, 1914, pp. 244–255.

The severe epidemic of bubonic plague which occurred, for the first time, in the province of Binhthuân (Annam) from February to August 1908, caused more than 2,000 deaths among the natives. The virulence of the epidemic was due to the highly insanitary conditions in which the poorer natives live. The majority of those attacked were women, who pass more time in the insanitary dwellings than the men. Rats and mice swarm in the poorer native quarters; those of the well-to-do natives are but slightly infested by these animals and there were only a few cases of the disease there. Infection in the pneumonic cases was probably caused by the inhalation of bacilli from clothing soiled by the excretions of infected rats, or by infection of the mucous membrane by infected Diptera.

VASSAL (J. J.). **Une Epidémie de Fièvre Récurrente au Tonkin.** [An Epidemic of Recurrent Fever in Tonkin.]—*Far East. Assoc. Trop. Med., C. R. Trois. Congrès Biennal* (*1913*), *Saigon,* 1914, pp. 296–308.

In 1912, the author observed an epidemic of recurrent fever in the province of Kien-An, Tonkin. In the 15 villages affected, there were 703 cases, of which 339 were fatal, being a mortality of 48 per cent. Transmission is evidently effected by body-lice, for the disease is prevalent from January or February up to June, that is, during the cold season when lice are abundant and the natives crowd together indoors. Recurrent fever was not recognised for a long time in Tonkin and was mistaken for malaria, cholera, plague, typhoid, etc. Hypodermic injections of atoxyl were employed in 157 cases and favourably influenced the course of the disease. Intravenous injections of salvarsan were administered in 195 cases and in all cases remarkable results were obtained, the patients recovering after a violent reaction. For children the average dose was 0·1 gramme, 0·25 gramme being used for adults. Salvarsan prevents the spread of epidemics by sterilising the carriers of infection. A bibliography of twenty-six works is given.

SCHÜFFNER (—). **Pseudo-Typhus in Deli (Variante der Japanischen Kedani Krankheit).** [A variant of the Japanese Kedani sickness.] —*Far East. Assoc. Trop. Med., C. R. Trois. Congrès Biennal* (*1913*), *Saigon,* 1914, pp. 309–315, 4 plates.

Since 1902, the author has observed a peculiar fever in Deli (Sumatra) somewhat resembling typhoid, but giving a negative result to serum diagnosis, it being also impossible to find specific bacilli. A similar disease is known in Japan (Kedani fever) and the Philippines. In Japan, a small red mite is said to be the carrier, while in Sumatra either a mite or a tick is concerned. In Japan the mortality is 30 per cent., while in Sumatra the figure is only 3 per cent. Four plates are given showing the appearance of the primary lesion and of the larval form of the probable carriers, CHEYLETIDAE and *Trombidium.*

STANTON (A. T.). **Anopheles and Malaria in the Eastern Region.**— —*Far East. Assoc. Trop. Med., C. R. Trois. Congrès Biennal* (*1913*), *Saigon,* 1914, pp. 514–519.

This paper is an endeavour to survey the Anophelines which transmit human malaria in the Oriental region. In the following lists the author gives (1) the names of those Malayan species which are now regarded as valid [see this *Review*, Ser. B, i, p. 6], (2) the specific names occurring in the literature which are regarded as synonyms, (3) the names of those valid species which are believed to have been erroneously recorded from the Malay Peninsula. Valid species are :—*A. aitkeni*, James, *A. albirostris*, Theo., *A. albotaeniatus*, Theo., *A. aurirostris*, Watson, *A. asiaticus*, Leicester, *A. barbirostris*, Van der Wulp, *A. fuliginosus*, Giles, *A. kochi*, Dön., *A. leucosphyrus*, Dön., *A. ludlowi*, Theo., *A. maculatus*, Theo., *A. nigrans*, Stanton, *A. rossi*, Giles, *A. tessellatus*, Theo., *A. umbrosus*, Theo., *A. watsoni*, Leicester, *A. wellingtonianus*, Alcock. [*A. sinensis* appears to have been omitted in the above list.] Errors in identification :—*A. listoni*, Liston, for *A. albirostris*, Theobald; *A. punctulatus*, Dönitz, for *A. tessellatus*, Theobald; *A. willmori*, James, for *A. maculatus*, Theobald. Professor Dönitz was engaged in describing the Anopheline fauna of Sumatra and Java at about the same time that Mr. Theobald was engaged on that of Malaya. Most English-speaking workers adopted the latter's nomenclature, neglecting the fact that often Professor Donitz's descriptions were published first; hence confusion has arisen.

Records of malaria infection in *Anopheles* are as follows: James enumerates the following species in India: *A. culicifacies*, Giles, *A. fuliginosus*, Giles, *A. listoni*, Liston, *A. maculipalpis*, James and Liston, *A. stephensi*, Liston. Christophers reports *ludlowi* in the Andaman Islands. From Sumatra, Schüffner reports a species which he refers to as *Anopheles* I* and which Eysell claims to be *A. rossi*; De Vogel (1910) also records the successful infection of *A. rossi* bred from salt-water pools. From Formosa, Miyajima and Kinoshita record *A. listoni*, Liston, *A. annulipes*, *A. sinensis*, Wied., *A. formosaensis*.

In the Federated Malay States, Leicester, James and Stanton report *A. maculatus*, Theobald, *A. karwari*, James (*nigrans*, Stanton), *A. umbrosus*, *A. fuliginosus*, Giles, *A. albirostris*, Theobald, *A. sinensis*, Wied. Further evidence is required to prove that *A. rossi* carries malaria, Drs. Schüffner and De Vogel being chiefly responsible for incriminating it. The author mentions *A. karwari*, *A. barbirostris* and *A. kochi* as having been examined by him with negative results. So far as malignant malaria is concerned, the group of small brown *Anopheles* which includes *A. listoni*, *A. culifacies* and *A. albirostris* is chiefly to blame in the Oriental region. Next in general importance is the *Nyssorhynchus* group, which comprises *A. maculatus*, *A. fuliginosus* and *A. stephensi*. The part played by such species as *A. ludlowi*, *A. sinensis* and *A. umbrosus* is less clearly defined and seems to warrant further inquiry. In concluding this useful paper, the author urges the further systematic study of the Anopheline fauna of the various countries represented at the Congress.

JENNINGS (A. H.). U.S. Bur. Entom. **Summary of Two Years' Study of Insects in Relation to Pellagra.**—*Jl. of Parasitology, Urbana*, i, no. 1, September 1914, pp. 10–21.

This paper is chiefly based upon the author's work in cooperation with the Thompson-McFadden Commission in 1912–1913. His conclusions are as follows :—Ticks, bed-bugs, mosquitos, fleas, horse-flies, and, in the absence of further and more incriminating evidence, lice, may be dismissed from consideration as transmitters of pellagra;

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*Since described by the author as *A. schüffneri*.—ED.

there is not only insufficient evidence to incriminate flies of the genus *Simulium*, but much evidence directly opposed to such incrimination, while the biting stable-fly, *Stomoxys calcitrans*, shows in a marked degree those characteristics of distribution, habit and association with man, which would pre-eminently fit it to be the vector of pellagra, if transmission of the disease by a blood-sucking insect is shown to be possible. If pellagra be found to be an intestinal disease of bacterial origin, house-flies and others of similar habits will in all probability be found to be an active factor in its causation.

TODD (J. L.). **Tick Paralysis.**—*Jl. of Parasitology, Urbana*, i, no. 2, December 1914. pp. 55–64.

Details are given of several cases of tick paralysis recently reported from British Columbia and Montana [see this *Review*, Ser. B, iii, p. 6.] A series of experiments was made with the object of producing paralysis in laboratory animals by the bites of *Dermacentor venustus*. Three monkeys, seven lambs, a guinea-pig and three puppies were employed. In many cases the ticks became engorged, but paralysis never ensued, in spite of the fact that some of them had been taken from cases of the disease. Negative results were also obtained when ticks were ground up in a solution of glycerine or normal saline and a filtrate of the mixture was introduced into rats and a lamb. It is concluded that, under experimental conditions, by no means every tick bite produces paralysis in laboratory animals and that a weak extract of ticks will not cause paralysis when injected into white rats, even though it possesses definite power to prevent the coagulation of blood.

LAMA (A.). **Contributo alla Epidemiologia della Lebbra.** [A Contribution to the Epidemiology of Leprosy.]—*Giorn. Ital. Mal. Ven., Milan*, xlix, 1914, pp. 465–472.

The author believes that *Dermatophyllus* (*Sarcopsylla*) *penetrans* (the chigger) frequently carries leprosy and points out that the early lesions in leprosy usually appear in the uncovered parts of the body. The attack of the flea usually irritates the lymphatics in its neighbourhood, and this pest also attacks rats.

FOX (C.). **A Further Report on the Identification of some Siphonaptera from the Philippine Islands.**—*Treasury Dept. U.S. Public Health Service, Washington, D.C.*, Hygienic Laboratory Bull. no. 97, October 1914, p. 18.

The author confirms his previous observations regarding *Xenopsylla cheopis* and *Ctenocephalus canis*, namely that the former is the only rat flea found in the Philippines, from which *C. canis* appears to be absent. An earlier statement that *C. felis*, Bouché, of the Philippines differed from that of the United States and Europe is corrected.

GLÄSER (H.). **Bestimmungsschlüssel der in Kamerun und Togo bekannten Tsetsearten.** [Key to the Species of Tsetse in Kamerun and Togo.]—*Arch. f. Schiffs- u. Trop. Hyg., Leipzig*, xviii, no. 16, August 1914, pp. 571–573.

This paper is based on the collection of flies in the Zoological Museum at Berlin. In Kamerun, the following species are said to be found :—*Glossina ziemanni*, Grünb., *G. tachinoides*, *G. pallicera*, *G. caliginea*, *G. palpalis* and *G. tabaniformis*. *G. morsitans* and the whole of the *morsitans* group are wanting. The specimens hitherto generally recorded as *G. morsitans*, are probably *G. tachinoides*. *G. ziemanni* was found once only.

G. palpalis, *G. longipalpis*, *G. morsitans* and *G. fusca* are found in Togoland.

Morstatt (H.). **Bestimmungsschlüssel der in Deutsch-Ostafrika bekannten Tsetsearten.** [Key to the species of Tsetse in German East Africa.]—*Arch. f. Schiffs- u. Trop. Hyg.*, *Leipzig*, xviii, no. 16, August 1914, pp. 574–575.

The species of *Glossina* found in German East Africa are *G. palpalis*, *G. austeni* (*tachinoides* of previous authors), *G. morsitans*, *G. pallidipes* and *G. brevipalpis*.

Koch (H). **Bericht über einen Versuch** *Glossina palpalis* **durch Fang zu beseitigen.** [An attempt to exterminate *Glossina palpalis* by capture.]—*Arch. f. Schiffs- u. Trop. Hyg.*, *Leipzig*, xviii, no. 24, December 1914, pp 807–810.

This paper describes an experiment carried out in the island of Mugassiro in Mara Bay on the east of Lake Victoria Nyanza, from the 29th January 1913 to the 31st January 1914. Four expert fly-catchers with nets were employed, one pair relieving the other every three months. This change was necessary because the natives soon tired of the monotonous work and also the results of one pair controlled those of the other. The island is about 1¾ miles in circumference, is uninhabited, and is covered with thick bush down to the beach. It abounds in crocodiles. The fly-catchers slept on the mainland. The daily catch of flies was put in glass vessels half filled with alcohol, and sent, at ten day intervals, to the camp on the mainland, where the flies were counted. In all, 74,382 flies were caught in 340 days, 49,883 being male and 24,499 female ; a similar preponderance of males was maintained throughout. The largest average daily catch (541) was made in April and the smallest (78) in December. The average daily catch in January 1913 was 205 and in January 1914, 102 ; in January 1913, only three days were available. As the figures show, the flies were not exterminated ; insufficient personnel and the formation of the island are considered responsible for the poor result.

Liston (W G.). **Report of the Bombay Bacteriological Laboratory for the Year 1913.**—*Bombay* : Govt. Central Press, 1914, 24 pp.

Further experiments on fumigation by hydrocyanic acid gas are described. A small, rat-proof, experimental store-room was filled with bags of rice among which rats were allowed to run freely. Fumigation destroyed all the animals, none being found within the grain bags. In rice, in bulk, fleas do not burrow deeply enough to escape the gas, which does not penetrate further than 2 or 3 inches into the grain.

To disinfect a barge of 12,000 cubic feet capacity, half an ounce of potassium cyanide per 100 cubic feet proved sufficient. Rats and fleas placed in different situations in the hold were nearly all killed after four hour's exposure to the fumes, though many survived one hour's exposure. In another experiment, an epizootic was started in a store-room, where a number of fleas were placed together with bundles of old clothing and gunny bags half full of rice. The clothes and gunny bags were later removed to flea-free store-rooms and it was found that, whereas infection occurred in the former, no plague was found among the rats where the gunnies had been placed.

Shevirev (Iv.), **Объ уничтоженіи накожныхъ паразитовъ въ арміи.** [On the destruction of external parasites in the army.] **« Новое Время.»**—[*Novoe Vremya*], *Petrograd*, 21st December 1914, p. 5.

The author advocates the use of the liquid of Dr. Malinin as a protection against lice in the army in the field. This liquid has been successfully used in many parts of Caucasia for the destruction of mosquitos in barracks and camps during the campaign against malaria. According to Dr. Girgoriev, the liquid was sprayed at night over the walls, ceilings, etc., of the rooms where the soldiers were sleeping, and their beds, their hands and arms as far as the elbows and legs as far as the knees, i.e., all parts of the body which are, or may become uncovered during sleep, were also sprayed. The result was a rapid death of the mosquitos present in the rooms and no new mosquitos entered during the night. All flies, bugs, fleas, Simuliidae and other human parasites were also killed. Some dogs, suffering from a parasitic skin disease, were also quickly cured by the application of this liquid. An experiment was also carried out on 40 pigeons suffering from lice, 20 of which were used as controls, while 20 were subjected to treatment with this liquid ; of the former 8 died and only 1 among the latter. The liquid does not in any way affect the health of men, has no effect on the skin, but irritates the mucous membranes, so that the soldiers had to shut their eyes, when it was applied to their faces. It has a greenish yellow colour and a slight smell of birch tar ; cotton and woollen materials retain this smell for 2–3 days, when kept in the open ; while linen, when worn underneath other clothing, retains it for a still longer time. It destroys rubber, so that it must be sprayed through metal tubes. In July 1910, the author had an opportunity of testing the liquid, while passing a night in the house of a forester, situated on one of the branches of the Volga ; before going to bed he sprayed the room and his bed with the liquid and neither was he annoyed by mosquitos, nor did he see any in the room during that night. He is convinced that no parasites can live in linen sprayed with this liquid.

The following is the recipe for the preparation of the liquid of Dr. Malinin, as given on pp. 16–17 of Dr. A. X. Grigoriev's work, **Противомоскитная жидкость д-ра медиц. Я. И. Мелинина, какъ средство борьбы съ маляріей** [Anti-mosquito liquid of Dr. med. J. I. Malinin, as a remedy in the campaign against malaria] (Tiflis, 1905, 118 pp.):—

The antimosquito liquid of J. I. Malinin is a mixture of extracts of five parts of Russian turpentine (oleum terebinthinae rossicum) and five parts of kerosene with one part of Persian powder (pulvis persicum), to which crystalline carbolic acid (acidum carbolicum crystallisatum), 5 per cent. of a specially prepared essence of cinnamon and 1½ per cent. of oil of cinnamon (oleum cinnamoni cassiae), are added. The method of preparation is as follows:—15 pounds of Russian turpentine and 3 pounds of Persian powder are placed in a wide-mouthed, well stoppered glass jar of 20 lb. capacity; the mixture is carefully stirred with a wooden spoon until no lumps remain. The jar is placed for three days in a warm place (extraction in the cold proceeds very slowly and is probably imperfect); the contents are thoroughly stirred twice a day. On the fourth day, the turpentine extract is carefully decanted from the powder into another glass jar of 40 pounds capacity, called hereafter the collecting jar, while 10 pounds of kerosene are poured on to the residue remaining in the first jar. The extraction with kerosene is stirred twice daily. On the third day, the extract, as far as practicable, is decanted into the collecting jar and the semi-liquid substance remaining in the jar is poured into a press to be pressed out. A hand press used for the extraction of meat juice was used; a cotton bag was put into the inner cylinder and the substance was poured into the bag. The liquid expressed from this substance is poured into the collecting bottle, the remainder being put back into the jar and 8 pounds of kerosene poured on it. This second extraction with kerosene proceeds for one day, under the same conditions as the first one, after which it is subjected to the same process of pressing. The double extraction with kerosene, followed by pressing, is necessary in order to extract the whole of the turpentine from the powder. The liquid expressed is poured into the collecting jar and the dry residue thrown away. After this, 2 pounds of crystalline carbolic acid, liquefied by heat (not by adding spirit), are poured into the collecting jar, as well as the same amount of a specially prepared essence of cinnamon and half a pound of cinnamon oil. All this is thoroughly shaken and left to stand for 24 hours and then filtered through a paper filter. The result gives the liquid of Malinin, which is mixed with an equal amount of kerosene before use. The essence of cinnamon used in the preparation of the liquid is prepared as follows: 15 pounds of Russian turpentine are poured over 3 pounds of powder of cinnamon (cort. cinnamon pulv.) and the whole is left to stand for a week in a warm place, stirring daily. The turpentine extract is poured into a separate bottle, and 15 pounds of kerosene poured over the remaining bark, which is then left to stand for three days under the same conditions, after which all possible liquid is decanted into the above bottle, the residue being pressed out; the expressed liquid is poured into the bottle containing the essence, the residue being thrown away. Before use, this essence must be shaken. The above formula for the preparation of the liquid, intended for use in soldiers' barracks, aimed at diminishing the cost and from this point of view, the question of the odour of the liquid was immaterial. When it is desirable to improve the odour, more cinnamon oil may be added, in the proportion of 3½ parts for every 100 parts of the liquid, the resulting liquid will be more costly but will have an agreeable smell of fresh hay. The antimosquito liquid prepared as above, has a greenish yellow colour in a thin layer, and a dark brown colour in large quantities. On contact with metals, e.g. if poured into metallic vessels, the colour becomes a fine emerald green, this however has no effect on its qualities. The peculiar, faint smell of birch tar is increased when the liquid is dissolved in kerosene (before use); it is not in any way disagreeable. When sprayed, the liquid at first causes a sense of oppression, but this passes away after a very short time, giving place to an agreeable freshness. This is specially noticeable in barracks.

GABBI (U.). **Sul modo come avvenne la comparsa e la diffusione della "febbre dei tre giorni" nella Sicilia Orientale e nella Calabria Inferiore.** [The advent and spread of Three Day Fever in Eastern Sicily and Lower Calabria.]—*Malaria e Malat. dei Paesi Caldi, Rome*, vi, no. 1, January-February 1915, pp. 21–26.

Sandfly fever, known in Europe, in Istria, Herzegovina and Dalmatia, appeared in Messina in 1909, being looked upon as a form of summer influenza. The author is positive that it never occurred there before and states that the data furnished by the 52 doctors who survived the earthquake [of December 1908] confirms this. The disease has always been associated with *Phlebotomus*, which can be carried alive for long distances, as from Malta to London and from Mostar to Vienna. The coasting vessels undoubtedly carry the flies from place to place and epidemics occur where conditions are favourable for their breeding. Such conditions were provided by the ruined structures left by the recent earthquakes. From 6,000 in 1910, the number of cases has diminished to a few hundreds in 1914, and during this period the ruins have been greatly reduced. If epidemics are to be prevented, it is necessary to provide for clearing away ruins, the construction of well built houses, the provision of proper sanitary requirements, and measures to prevent the importation of flies from endemic areas to such as are at present free from infection. Though the period of the fever is short, it incapacitates the patients for weeks, and the loss thus caused to industry would be from 1 to 1½ million pounds in the earthquake area, with a probable 50,000 persons attacked.

ELLACOMBE (G. W.). **Report on Examination of the Ndola District (Northern Rhodesia) for Sleeping Sickness.**—MS. report to the British South Africa Company.

The author visited Ndola in September 1914 to endeavour to ascertain the locality in which a European had been infected with trypanosomiasis two years previously, and to enquire into various deaths. Only three cases of sleeping sickness were discovered among 1,805 people palpated. Fly (*Glossina morsitans*) was scarce, but general.

LEACH (H.). **Report on Examination of Kakumbi's and neighbouring villages (Northern Rhodesia) for Sleeping Sickness.**—MS. report to the British South Africa Company.

The author visited the village of Kakumbi (Fort Jameson Division) in November 1914 and found two persons infected with sleeping sickness among the 123 inhabitants. Six persons were said to have lately died from the disease, known to the natives as "Mallali." Other villages were therefore visited and among 392 persons examined (including the above 123), 10 cases were found. All these places are within a short distance of the Luangwa River and may be said to be within the same fly belt. *Glossina morsitans* was scarce. The disease is believed to be recent in this locality.

Le Prince (J. A. A.) **Malaria Control-Drainage as an Antimalarial Measure.**—*Public Health Reports, Washington, D.C.*, xxx, no. 8, 19th February 1915, pp. 536–545, 13 figs.

Under the following heads the author discusses the special type of drainage required for mosquito control and eradication which, while ensuring drainage of the land, will not provide breeding places :—Training natural streams and water courses ; open ditches and intercepting ditches ; the installation of permanent lining in ditches ; subsurface drains ; filling ; and proper maintenance. A stream should have steep banks directly above and below the flow line, uniform grade and width, a straight course, and be free from grass, sticks, stones, and other obstructions to the current. Directions are given for attaining these results, which chiefly involve questions of proper regrading. There should be as few ditches as possible and they should have clean-cut, sloping edges, narrow bottoms and straight courses. Instead of repeatedly regrading, cleaning and oiling ditches or portions of them, it is often cheaper to line them with concrete. Stone with cement, mortar, lumber, or concrete may be used. For small ditches, the lining need only come up to 3 inches above the normal water line. To prevent side scour above the lining, especially at curves and bends, the outer wall lining may be raised or the ditch may be widened or key walls installed. The latter will also prevent side scour and under scour of straight ditches of heavy grades. Weep or seepage holes are necessary above the key wall and should slope towards the centre or bottom of the ditch. They drain the water behind the lining and should be made in the sides of the lining before the concrete has set. Linings should be U-shaped with sloping sides. With the aid of diagrams, the different principles involved are explained where subsoil drainage by means of drain tiles is employed for the purpose of lowering the water table and for that of intercepting seepage. The subsurface drain has the following advantages over open ditches :—It is self-cleaning, it maintains itself, permits of rapid inspection, needs very little attention, requires no oiling and does not permit of water being accessible to mosquitos. Cinders are very good for filling ground. The destruction of algae by copper sulphate is mentioned, and the qualifications of the inspector required and his work are described.

Le Prince (J. A. A.). **Control of Malaria. Oiling as an Antimosquito Measure.**—*Public Health Reports, Washington, D.C.*, xxx, no. 9, 26th February 1915, pp. 599–608.

In treating mosquito-infested waters with oil, it is not practicable to state how much oil should be used per unit of area. The density and spreading qualities of various shipments of commercial oils, even of oil from the top and bottom of the same barrel, may vary so much as to upset all calculations. Just sufficient oil should be used to form a complete film. Untrained persons sometimes have difficulty in recognising a film of kerosene, when present on water. Methods of oiling are considered and an account of oil drips is given. A simple form of drip consists of a petroleum tin on a board, placed across the drain which requires oiling. A nail is inserted in the bottom of the tin, head upwards, *i.e.* inside the tin, and cotton waste is placed around its head. By pulling the point of the nail downwards or gently pushing it upwards the flow of oil may be decreased or increased as desired. For thinner oils a 5-gallon can with a metal discharge tap may be used, while for the heavy crude oil of asphalt base, largely used at Panama, a flat lamp-wick drip was employed in a flat wick-holder which was compressed or widened to regulate the rate of flow. On ditches or streams having an average width of water surface of 1 foot, from 10 to 20 drops of oil per minute are applied; the quantity varies with local conditions. Several drip cans may be necessary on long extensions. Where the use of a drip can is not warranted, a small bundle of oil-soaked cotton waste may be placed at the source of the water, being re-soaked about every week, when exhausted; the heavier oils are best for this purpose. This practical paper concludes with notes on personnel, inspections, maps and records.

JAMIESON (S.). **Malaria arising in a non-malarial district.**—*Med. Jl. of Australia, Sydney*, i (2nd year), no. 8, 20th February 1915, pp. 163–168.

A scrub-cutter and cleaner from the Gosford district of New South Wales was admitted to hospital suffering from simple tertian malaria. Anophelines are known to be present in that part of Australia, but hitherto, no case of locally caused malaria has been reported. In view of the return of a number of malaria-infected troops from New Guinea, the occurrence of such a case is of importance.

HADWEN (S.). **Warble Flies: A Further Contribution on the Biology of** *Hypoderma lineatum* **and** *Hypoderma bovis*.—*Parasitology, Cambridge*, vii, no. 4, March 1915, pp. 331–338.

An account of experiments performed in 1913 and the spring of 1914 with larvae of *Hypoderma* taken from the gullets of cattle is given. Although no definite results were obtained, the experiments corroborate the view that warble flies gain an entrance through the skin [see this *Review*, Ser. B, iii, p. 19,] and seem to show that the larvae select the gullet for reasons connected with their growth, which, it is suggested, may be a freer supply of oxygen and a loose areolar tissue offering them little resistance. The larvae lie horizontally under the hide and are thus less affected by the skin movements than if they were perpendicular. Cattle are much less worried by *H. lineatum* than by *H. bovis* and the seasonal activity of the former is earlier than that of the latter. Observations made on oviposition confirmed those of Riley and Gläser. Further proof was afforded of the terror which *H. bovis* inspires in cattle It was observed that when the cattle, after becoming exhausted, lie down, apparently indifferent to the attacks of the fly, the eggs were laid higher up on the body of the host.

STRICKLAND (C.). **Note on a case of "Tick-Paralysis" in Australia.** —*Parasitology, Cambridge,* vii, no. 4, March 1915, p. 379.

A boy of eleven, who got a tick in his ear while in the bush, became sick and giddy four days later and subsequently unable to walk without assistance. He recovered ten days after the tick, which was not identified, had been removed.

NUTTALL (G. H. F.). **Observations on the Biology of Ixodidae, Pt. ii.** —*Parasitology, Cambridge,* vii, no. 4, March 1915, pp. 408–456.

A further contribution to the biology to the IXODIDAE [see this *Review*, Ser. B, i, pp. 111–112] is given. *Rhipicephalus sanguineus* requires three hosts upon which to feed in the larval, nymphal and adult stages; larvae were experimentally reared on dogs and rabbits, nymphs on dogs, jackal and hedgehog, adults on dog and jackal. The length of time the ticks feed varies with the host; on dog or jackal, the times were generally four days for the larva and nymph respectively; on a hedgehog, the nymphs required from 10–17 days. Females generally fed for eight days, while the males remained for an undetermined period. The temperature at which the host is maintained does not seem to affect the length of the parasitic period. Of 707 adults descended from two females, 285 were male and 422 female. The time required for metamorphosis from egg to larva is 17–19 days at 30° C., 75 days at 12° C.; from larva to nymph 5–8 days at 30° C.; from nymph to adult 11–12 days at 30° C. The longevity of some unfed ticks was very marked, 1 out of 20 lots of larvae survived for 253 days, while only 2 out of 55 nymphs survived for 97 days; out of 575 adults only 84 had died by the 569th day, the females appearing to have even more vitality than the males. Under the most favourable conditions, notably at 30° C., during the period of metamorphosis, the life-cycle may be completed in 63 days. It is noted that Christophers has demonstrated by experiment that nymphs and adults descended from females infected with *Piroplasma canis*, and also adults emerging from nymphs which had fed on dogs suffering from piroplasmosis, were capable themselves of producing this disease in other dogs.

NUTTALL (G. H. F.). **Artificial Parthenogenesis in Ticks.**—*Parasitology, Cambridge,* vii, no. 4, March 1915, pp. 457–461.

As a result of repeating his experiment on parthenogenesis in ticks [see this *Review*, Ser. B, i, p. 155], the author is convinced that the parthenogenesis observed was artificial, being induced by the method employed for counting the eggs, i.e. the eggs were separated by immersing them in normal salt solution and rubbing them about gently with the aid of a camel's hair brush. Of 15,296 eggs counted, only 218 yielded larvae.

FRANCHINI (G.) & MANTOVANI (M.). **Infection expérimentale du rat et de la souris par** ***Herpetomonas muscae-domesticae.*** [Experimental infection of the rat and the mouse with *Herpetomonas muscae-domesticae.*]—*Bull. Soc. Path. Exot., Paris,* viii, no. 3, 10th March 1915, pp. 109–111.

The authors have made experiments as to whether *Herpetomonas* *muscae-domesticae* can produce infection in the rat and the mouse and conclude that slight infection may be produced in these animals, as is the case with the flagellates of fleas, mosquitos, and *Melophagus ovinus.*

ROUBAUD (E.). **Les zônes à tsétsés de la Petite-Côte et du Bas-Saloum (Sénégal).** [The tsetse belts of the Petite-Côte and of the Lower Salum (Senegal).]—*Bull. Soc. Path. Exot., Paris*, viii, no. 3, 10th March 1915, pp. 130–137.

This paper deals with the habitat of *Glossina palpalis* in the Petite-Côte, Senegal, and with the tsetse belt which extends between the estuary of the English Gambia and that of the Salum. On a rapid journey through Thies, Nianing, Ngazobil and Fatik, the author found *G. palpalis* only, though *G. longipalpis* was taken there by Thiroux and D'Anfreville. The most important focus of trypanosomiasis in Lower Senegal is that near Nianing. The *G. palpalis* zone is there characterised by trees peculiar to a savannah park, such as baobabs, figs, tamarinds and cotton trees, with thick bush between them, consisting of jujube trees, acacias, tamarisks, etc. The fly was abundant in the bush, both near the dry swamp and at more than a kilometre from its banks; it was absent only in particularly arid places where thorn trees alone were found. The peculiar distribution of *G. palpalis* in the Petite-Côte is essentially due to the geographical orientation of the region, which is protected against the trade winds and therefore lacks dunes, so that vegetation extends right down to the sea. The moisture from the sea maintains the hygroscopic conditions necessary to the fly. In the Petite-Côte, the sea plays the role of the sheets of water necessary for permanent haunts of this *Glossina.* The fly in Nianing transmits at least two animal trypanosomes besides the human trypanosome. A kid upon which sixty flies were fed for three days became infected with *T. cazalboui.* Of the seven horses at Nianing, four were infected with *T. dimorphon* and one with *T. cazalboui*; horses do not generally survive two winters at Nianing. It is important to try and destroy this focus of trypanosomiasis as it injures trade and the fly zone is not extensive. An experimental clearing of the bush was undertaken near the swamp, but it was on too small a scale. The whole zone between the marsh and the sea must be cleared.

On the Lower Salum, *G. palpalis* and *G. morsitans* were met with. *G. palpalis* is found in all the mangrove areas and is especially abundant around Fundiugne, in the small islands of the estuary. *G. morsitans* is a veritable scourge on the Lower Salum, especially in the small coastal province of Niom-Bato which is a very important centre of cattle trypanosomiasis. Niom-Bato lies between the estuary of the English Gambia and that of the Salum; it is of the savannah-park type with few villages, and the bush is inhabited by game, particularly by big antelopes. Brackish marshes subject to tidal influence are a feature of this area. The sea penetrates into the heart of the savannah in the form of narrow channels fringed with mangroves. At low water, monkeys, antelopes and crabs can be seen on the uncovered land. Apart from this abundant maritime irrigation there is little water. Wells are rare and often at a distance from the villages. In spite of its maritime peculiarities, the Niom-Bato region may be considered as an extreme western prolongation of the *G. morsitans* savannah of the Upper Gambia. After passing the salt swamps, *G. morsitans* becomes rarer and often gives place to *G. palpalis.* The physical characteristics of the haunts of both species are shown in a table; the relative humidity of the atmosphere in the localities where *G. morsitans* was found varied from 28 to 50 per cent., as compared with 70 per cent. where *G. palpalis* occurred. No human trypanosomiasis has been found in the Lower Salum. As in the Upper Gambia, the presence of *G. morsitans* is immediately seen in Niom-Bato in the almost complete absence of domestic animals; no dogs, horses, asses, sheep or large-sized cattle are to be met in the infested zone. In the villages outside, but within 12 miles of it, dogs and horses are found, but their wanderings expose them to attack and the mortality amongst them is heavy. As in the Upper Gambia, the natives are ignorant of the deadly effect of the fly. They attribute the animal mortality to a particular grass. In the whole fly zone the only domestic animals found are goats, which do not leave the villages, and the little Fouta oxen which graze constantly amongst the *Glossina,* as they also do in the Malinké country in the Upper Gambia. In Niom-Bato, they are not, however, used as beasts of burden as they are in Upper Gambia. *T. dimorphon* was found in three of the thirty oxen at Messira. Out of a total of fifteen flies captured at Messira and Kumbeng, three showed an infection typical of *T. dimorphon.* Eighty flies, captured at hazard, in Niom were fed on a clean goat, which became infected with *T. cazalboui. T. pecaudi* was not found, but it is doubtless present. The development of the Niom-Bato district is badly hampered by the presence of *G. morsitans.* From an economic standpoint, it would be most desirable that systematic measures be taken against the fly. The fly-belts of Niom are but a vestige of those formerly existing in the whole savannah bordering the Gambia; they would disappear completely after clearing is practised and the big game is destroyed, as they have already done in districts along the rivers in the mid portion of the Gambia.

Public Stable in Panama.—*Canal Record, Balboa,* viii, no. 32, 31st March 1915, pp. 288–289.

The death-rate in the city of Panama, especially that of children, is believed to be considerably increased by the transmission of disease by flies, and instructions have now been issued for the construction by the Panama Railroad of a public stable of 250 stalls for the accommodation of animals now housed in various private stables in the city. It has also been pointed out that the present stables are prolific breeding places for rats, the principal carriers of plague.

ROTHSCHILD (Hon. N. C.). **A Synopsis of the British Siphonaptera.**—*Entom. Mthly. Mag., London,* li, no. 610, March 1915, pp. 49–112, 8 plates.

A synopsis of the British Siphonaptera is given, with a view to furnishing ready means of identification of all fleas so far recorded from the British Isles. Brief descriptions of the characters likely to prove of value for identification are given, with the chief hosts of each species. Instructions for collecting and preserving fleas are added.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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BOLT (R. A.). **Sandflies (*Phlebotomus*) in China and their Relation to Disease. Preliminary Considerations on the Identification and Distribution of Sandflies in China, with Special Reference to *Phlebotomus papatasii*, Scopoli.**—*China Med. Jl. Shanghai*, xxix, no. 2, March 1915, pp. 78–86, 6 figs.

Sandflies and the fever due to them are common in North China, May and June being the worst months. The natives of the region appear to be immune, but all others suffer, especially young children. Febrile attacks of three days are common and are sometimes followed by prostration for a week or more. Old ruined buildings are the favourite haunts of *Phlebotomus.* The author circulated an enquiry in order to ascertain the distribution of the pest in China and the replies seem to indicate that it does not occur in South China, is rare along the Yangtze and attains its maximum along the line from Pekin and Tientsin to Tongshan, Peitaiho, Chinwangtao, and Shanhaikwan. Reports from Formosa and Korea indicate that the flies have not been recognised there. The species of *Phlebotomus* concerned is as yet undetermined, but specimens have been sent to Professor Newstead for identification. A list of 13 references concludes the article.

FRÄNKEL (S.). **Ueber ein neues, sehr wirksames Mittel gegen die Kleiderlaus.** [A new and very effective destroyer of clothes lice.] —*Wiener klinische Wochenschr.*, *Vienna*, xxviii, no. 12, 25th March 1915, pp. 313–314.

In searching for a substance suitable for use against *Pediculus humanus* (*vestimenti*) the author states that he accidently discovered it in methylphenylether, known under the name of anisol. The parasites are completely stupefied within four minutes, and in ten minutes they invariably die. Anisol is harmless to man; it is 12 times less poisonous than phenol if taken internally and has no action on the skin if applied externally. As it labours under the disadvantage of having to be imported into Austria, it is pointed out that it can be readily produced by methylating phenol.

KNAB (F.). **Dipterological Miscellany: Evolution of the Blood-sucking Habit in** *Symphoromyia.*—*Proc. Entom. Soc. Washington, Washington, D.C.*, xvii, no. 1, March 1915, pp. 38–40.

The blood-sucking habit is unequally developed in several families of Diptera, and information recently received shows that certain species of *Symphoromyia* are aggressive biters, while others are in process of acquiring the blood-sucking habit. *S. pachyceras*, Will., from British Columbia, seems to be one of the latter, as it is said to bite unprotected parts of animals, but to prefer taking the blood oozing from a bite left by a larger fly such as a *Tabanus.* The re-discovery of *Musca leprae*, L., described on p. 598 of the 10th edition of the *Systema Naturae*, would be of great importance, its habitat being given in this book as Elephantiasi Nigritum Americae. It is suggested that the West Indian islands, where elephantiasis is common, would be likely to contain it.

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Bolshakov (A.). **Чесотка животныхъ и борьба съ нею.** [Scabies of animals and its control.] **«Наше Хозяйство.»** [*Our Husbandry*], *Eletz*, no. 18–19, 1914.

In order to control mites causing scabies, the following remedies are recommended: The isolation of the diseased animals; the cleansing of the buildings; the disinfection of the harness; treating the animals by washing them with green soap, or with a jelly consisting of one part of naphthaline or creolin and 10 parts of light oil or vaseline. As an effective remedy, especially in case of serious outbreaks, washing the animals with a mixture of 2 lb. of lime and flowers of sulphur, boiled in about 5½ gallons of water till it turns of the colour of beer, followed by a washing, five or six days later, with a weak alkali, is recommended.

Tarassevitch (L.). **Дезинфекція и дезинсекція.** [Disinfection and disinfectants.] **«Природа», (Москва).** [*Nature*], *Moscow*, iii, no. 12, 1914, pp. 1514–1518.

A number of methods of controlling insect parasites of man are given. For the purpose of disinfecting on a large scale, the use is suggested of various compounds. Their composition is as follows:—(1) Liquid of Malinin: 1,000 grms. of Persian insect-powder is extracted with 2,700 grms. of Russian turpentine during five days; the residue is pressed out and extracted again with 2,700 grms. of kerosene, after which both extracts are mixed and 250 grms. of pure carbolic acid and 75 grms. of oil of cloves added. (2) The Odessa liquid: A mixture of 100 grms. of xylol, 200 grms. of carbolic acid, 400 grms. of glacial acetic acid and 3 litres of kerosene. (3) The liquid of Gribinyuk: 200 grms. of carbolic acid, 500 grms. of napthaline, 280 grms. of sulphuric-ether, 3 litres of Russian turpentine. (4) Liquid destroying the insects and their eggs: 100 grms. of carbolic acid, 100 grms. of naphthaline, 900 grms. of Russian turpentine and 900 grms. of kerosene. As a protection against attacks of insects, it is particularly recommended to soak the linen with a 10 per cent. solution of white birch tar (resin) with 10 per cent. of soda. At the end of the article the author reports that, after the conclusion of the Russo-Japanese war, the whole of the Japanese army was subjected to wholesale disinfection before being dispatched home, and considers that this example should be imitated. [See this *Review*, Ser. B, iii, pp. 105 & 124.]

Вши и свиньи. [Lice on pigs].—**«Вѣстникъ Псковскаго О-ва Сельск. Хоз.»** [*Messenger of the Agricultural Society of Pskov*], *Pskov*, iii, no. 3, 1914, p. 13.

As a remedy against lice on pigs, a decoction of snuff tobacco and green soap is recommended. The infested animal is washed with this decoction diluted in warm water.

KIRILLOV (L.). **Уничтоженіе паразитовъ на рогатомъ скотѣ.** [The destruction of parasites on cattle.]—**«Хозяйство на Дону.»** [*Husbandry on the Don*], *Novotcherckassk*, x, no. 4, 7th March 1915, pp. 169–170.

Some advice on the destruction of parasites on cattle is given. Besides keeping the animals in good condition, they should be washed, when attacked by parasites, with a mixture prepared as follows:—1 lb. of tobacco leaves are boiled for one hour in six pints of water, after which the leaves are removed and two pints of weak spirits added to the decoction. It is not advisable to apply this solution or to rub in kerosene into the skin over the whole body at one time, but it ought to be done gradually over a period of several days.

EDWARDS (F. W.). **New and Little Known East African Culicidae.**—*Bull. Entom. Research, London*, v, pt. 4, March 1915, pp. 273–281, 3 figs.

Collections recently received by the Imperial Bureau of Entomology, chiefly from Natal, have brought to light several interesting new forms of mosquitos. The opportunity has been taken of publishing revised keys to the African species of *Banksinella* and *Taeniorhynchus*. The following new species are described:—*Ochlerotatus chelli*, from British East Africa; *O. bevisi*, from Durban; *Taeniorhynchus auripennis*, from Entebbe; *T. chubbi* and *T. aureus*, from Durban; and *T. chrysosoma*, from Karonga, Nyasaland.

EDWARDS (F. W.). **Diagnoses of New Bornean Culicidae.**—*Bull. Entom. Research, London*, v, pt. 4, March 1915, pp. 283–285.

The following are preliminary diagnoses of new species of CULICIDAE from Kuching, Sarawak, received from Mr. J. C. Moulton, and either collected by the donor or forming part of the old collection of mosquitos in the Sarawak Museum, which was for the most part obtained in the neighbourhood of Kuching by Messrs. J. Hewitt and J. E. A. Lewis. *Armigeres confusus*, *A. kuchingensis*, *Aëdes*(?) *curtipes*, *Culex mimulus*, *Culiciomyia spathifurca*, *Uranotaenia brevirostris*, *U. obscura*, *Rachionotomyia nepenthis* and *R. proxima*, are described.

NEAVE (S. A.). **The Tabanidae of Southern Nyasaland with Notes on their Life-histories.**—*Bull. Entom. Research, London*, v, pt. 4, March 1915, pp. 287–320, 5 plates, 30 figs.

The TABANIDAE dealt with in this paper were chiefly obtained from both British and Portuguese territory in the neighbourhood of Mt. Mlanje. This mountain is nearly 10,000 feet high and rises from a number of rolling plateaus, averaging about 6,500 feet above sea-level and consisting mostly of open country covered with short grass, with dense forest in the hollows and along the banks of streams. Below this, is a large area from 2,400 to 2,000 feet with much forest on its south and south-east side. Few Tabanids were found on the high plateau, but in the lower forested areas they were much more numerous, especially in the drier districts beyond the range of the climatic influence of Mt. Mlanje. The predaceous enemies of Tabanids were investigated, and Asilid flies were found preying on representatives of the following genera :—*Dorcaloemus* 2, *Chrysops* 1, *Silvius* 22, *Haematopota* 37, *Tabanus* 13, while examples of a fossorial wasp, *Bembex möbii*, Handl., were captured in the act of carrying off females of *T. taeniola* and *Haematopota mactans*, which were feeding on cattle.

The investigation of Tabanid larvae, which was the chief object of the author's visit, was at first delayed by the difficulty of locating them, but ultimately numbers were obtained from the sand and mud on the edges of rivers, streams and swamps. It appears probable, from the observations made, that the bulk of Nyasaland TABANIDAE have only one brood a year ; certain species of *Chrysops* and *Haematopota* may possibly be double-brooded, but this depends greatly on larval food supply and local conditions. The question of distinct broods is complicated by the fact that larvae from the same batch of eggs vary greatly in their rate of growth and a proportion of the imagines emerge at very irregular intervals. Details are given of the methods found best for rearing and feeding the larvae, which, in their resting stage, may remain weeks or even months several inches below the surface of the mud ; this habit would appear to be an adaptation to climatic conditions in Nyasaland, the very long and well-marked dry season involving risk from the drying up of the mud at less depths. Adult Tabanids are exceedingly difficult to keep alive in captivity, but large cages with soft elastic walls of mosquito netting were found fairly satisfactory, otherwise the insects damage themselves against the cage. It is difficult to induce them to suck blood in captivity, though they will feed readily on honey and water. Breeding can probably only be successfully carried out in cages large enough to contain a good-sized mammal. The females are not easily disturbed when ovipositing. The cement covering of the egg-masses is very insoluble, and some eggs hatched out after the mass had been immersed in 70 per cent. alcohol for two days. The young larvae grow slowly at first and are very active in water ; the older ones are more or less nocturnal in their habits, and those of most species are frequently cannibalistic.

Fifty-six species are recorded, with notes on the habits of both larvae and adults in several cases. The text-figures include a large number of drawings of the terminal asters of the pupae which are useful in distinguishing them. The following species are described as new :—*Silvius apiformis*, a remarkable bee-like species confined to forested rivers ; *Silvius monticola*, taken at 6,500 feet on the Mlanje Plateau ; *Chrysops bimaculosa* ; *C. woodi* and *C. austeni*, two brilliantly coloured species which seem to form a distinct group among the African representatives of this genus.

Some of the early stages of the following species are described and figured :—*Chrysops longicornis*, Macq., *C. magnifica*, var. *inornata*, Aust., *C. wellmani*, Aust., *C. bimaculosa*, sp. n. ; *Haematopota insatiabilis*, Aust., *H. crudelis*, Aust., *H. decora*, Walk. ; *Tabanus maculatissimus*, Macq., *T. corax*, Lw., *T. biguttatus*, Wied., *T. taeniola*, P. de B., *T. ustus*, Walk., *T. fraternus*, Macq., *T. atrimanus*, Lw., *T. variabilis*, Lw., *T. insignis*, Lw., *T. laverani*, Surc., *T. nagamiensis*, Cart., *T. gratus*, Lw., *T. obscuripes*, Ric., *T. medionotatus*, Aust., and *T. pertinens*, Aust. The sites of some Tabanid breeding places are illustrated by photographs

STRICKLAND (C.). **The Comparative Morphology of the Anophelines** *Nyssomyzomyia ludlowi*, **Theo., and** *N. rossi*, **Giles.**—*Bull. Entom. Research, London*, v, pt. 4, March 1915, pp. 321-324, 1 plate, 2 figs.

Notes on the distinctive characters of *Anopheles ludlowi* and *A. rossi* are given. The larva of *A. ludlowi* has been previously held to be indistinguishable from that of *A. rossi*, whereas it is in reality very distinct. The egg, larva, pupa and imago are described, the distinguishing characters pointed out, and both sexes of the adult of each species, figured.

WATERSTON (J.). **Notes on African Chalcidoidea. II.**—*Bull. Entom. Research, London*, v, pt. 4, March 1915, pp. 343-372, 17 figs.

A new Eulophid, *Syntomosphyrum glossinae*, bred from the puparium of *Glossina palpalis*, in Uganda, by Dr. G. D. H. Carpenter, is described.

STANTON (A. T.). **A New Anopheline Mosquito from Sumatra.**—*Bull. Entom. Research, London*, v, pt. 4, March 1915, pp. 373-375, 2 figs.

In the course of an investigation of malaria in the Lampongs, a district of South Sumatra, in May and June 1914, Dr. Schüffner captured a large number of Anopheline mosquitos, among them a series of a species which he recognised as new to Sumatra. This is now described from six females, and has been named *Anopheles schüffneri*. [See this *Review*, Ser. B, vol. iii, p. 102.] The larva has not yet been identified.

Observations on *Glossina morsitans* **in Northern Rhodesia.**—*Bull. Entom. Research, London*, v, pt. 4, March 1915, pp. 381-382.

The British South Africa Company have recently received a report from Mr. R. A. F. Eminson, one of the three Entomologists engaged in the study of the bionomics of *Glossina morsitans* in Northern Rhodesia, upon the work done by him from May to July 1914. In the course of his remarks on breeding places, the author states that he has not yet succeeded in ascertaining definitely why certain spots are specially preferred by *G. morsitans* for breeding purposes; but two negative points are noted—namely, that in country otherwise suitable, no favoured breeding places have been found in any localities in which there was any depth of sandy soil or in which there was a dense growth of long grass. Although a search was made for pupae over a considerable area, the great majority were found within a comparatively restricted space. This favoured area is described as being uniformly covered with forest trees; very little grass grows amongst the trees, and that little is short; the soil is of a sandy, gravelly nature and very thin, merely covering the underlying granite which crops out in places. Little signs of game were noticed, not more than in the surrounding country, if as much. The breeding places which yielded the greatest number of pupae and empty pupa-cases were situated near the path; the flies had evidently been feeding on game, or more probably on human beings, preparatory to depositing their larvae. It is noted that many of the logs under which large numbers of pupae were found were devoid of bark, and, in the author's opinion, the female *Glossina* prefers a smooth barkless log on which to rest before depositing a larva. They also show a preference for a log which, for some part of its length, is raised a few inches above the ground, thus affording a shady resting place ; a point which has already been emphasised by Lloyd. In May 1914, of 300 flies examined, 41 contained recognisable mammalian blood and 2 non-mammalian blood. There is possibly a seasonal change in the food supply. A Hymenopterous parasite of the genus *Mutilla* was found in several pupae of *G. morsitans*, and out of 80 pupa-cases, 3 appeared to have been attacked by a Chalcid, though it is uncertain whether the latter is a primary parasite or a hyperparasite.

Turner (R. E.). **A New Species of *Mutilla* parasitic on *Glossina morsitans*.**—*Bull. Entom. Research, London*, v, pt. 4, March 1915, p. 383.

This is a description of the new species of *Mutilla* referred to above. It has been named *Mutilla glossinae*.

Fitzgerald (J. C.). **Report of the Deputy Territorial Veterinarian for the Maui District.**—*Rept. Bd. Commissioners Agric. and Forestry, Hawaii, for the biennial period ending 31st Dec. 1914*; *Div. Animal Industry, Honolulu*, 1915, pp. 230–240, 4 plates.

A parasite of chickens, known as the San Diego flea, appeared in Maui 2 years ago, and has recently been noted in the Kahului district. This parasite infests the head and neck of fowls and pigeons, causing sores on the combs of the former and, in many instances, death. By the use of gasoline, the fleas can be removed instantly, without any ill effect on the bird. The bird is held by the legs in one hand and with the other the eyes and nostrils are closed. It is then submerged in a bath of gasoline for a few seconds.

Surface (H. A.). **To keep down House Flies.**—*Zool. Press Bull., Div. of Zoology, Pennsylvania Dept. Agric., Harrisburg, Pa*, no. 313, 26th April 1915.

Ground phosphate rock when scattered over manure heaps, readily destroys the larvae of house flies [see this *Review*, Ser. B., ii, p. 179] and at the same time increases the value of the manure. Other materials, such as oil, blue vitriol, etc., can be used to kill the larvae, but make it impossible to use the manure with safety on plants.

v. Łobaczewski (A. R.). **Zur Frage der "Entlausung."** [The removal of lice.]—*Wiener klinische Wochenschr., Vienna*, xxviii, no. 14, 8th April 1915, pp. 373–374.

The author, chief surgeon of a military hospital at Cracow, recommends the impregnation of body linen with a 30 per cent. solution of *Oleum betulae* (oil of birch tar) in 96 per cent. alcohol as an efficient method of keeping the body free of lice. The process must be renewed each time the linen is washed ; it takes about 15 minutes to carry out.

On adding the oil to the alcohol, a portion of the former is precipitated in about a quarter of an hour; the supernatant fluid is decanted and poured over the linen, which is then wrung out and dried at ordinary room temperature. The garments will be slightly greasy and more pliable; they may be worn for several weeks and retain their lice-free properties until washed. The body does not require any attention; the simple wearing of garments thus treated being sufficient to free it completely within 3 days.

GRIFFITHS (J. A.). **Demodectic mange of domestic animals in Nyasaland.**—*Jl. Comp. Path. Therap., London*, xxviii, pt. i, March 1915, pp. 61–64, 1 fig.

Demodex folliculorum was apparently unknown in Nyasaland until about five years ago and was probably introduced with imported cattle. Outbreaks are almost confined to the Shire Highlands, and only once was the disease found at any distance from this district, and then in a bull from the infected area. Cattle owned by Europeans are the greatest sufferers, but it has been found in sheep, pigs, dogs and cats. A nodular eruption of the skin, usually of the neck and shoulders, is the first symptom, and this may persist for eighteen or more months; the native herdsmen attribute these nodules to the bites of flies. Emaciation and debility set in, and the death-rate is high, 80 per cent. in one herd. The use of Coopers' Improved Cattle Dip, by spraying or dipping once a week, has been found to be a good remedy, combined with the usual sanitary measures, disinfection of premises, segregation, etc. Emaciation does not begin till the nodules break and become purulent. Diagnosis with the microscope is rapid and easy. The danger of spread of infection is so great that it is not considered economical to treat all animals, but better to slaughter them.

SHEATHER (A. Leslie). **An improved method for the detection of mange Acari.**—*Jl. Comp. Path. Therap., London*, xxviii, pt. i, March 1915, pp. 64–66.

The material to be examined is boiled in a 20 per cent. solution of Antiformin, and the sediment collected by the use of a hand centrifuge, the sediment is then examined with a little water, when the acari can be readily detected. The material is then placed in a wide test-tube and about 10 cc. of caustic potash are poured in, the tube is then cautiously warmed, and finally brought to the boil. The boiling is continued until all the coarse particles are destroyed. By experiment, it has been found that boiling for ten minutes is not sufficient to damage the parasites, and in practice it is seldom or never necessary to continue boiling for that length of time.

A small hand centrifuge is all that is required for the sedimentation, because a few turns only of the handle (not more than eight or ten) are sufficient to throw down the parasites, if any are present. It is, in fact, a disadvantage to carry the centrifuging so far, as this throws down a quantity of the finely granular sediment which is better left in suspension in the liquid. By this method, parasites have been detected in scrapings soaked in caustic potash, which had been examined and pronounced free.

GAIGER (S. H.). **A revised check list of the animal parasites of domesticated animals in India.**—*Jl. Comp. Path. Therap., London,* xxviii, pt. i, March 1915, pp. 67–76.

This is a revision and extension of the list published in 1910, in the *Jl. of Trop. Vet. Sci.*, v, no. 1. The internal parasites are arranged under the part or organ affected. The external, under ticks (16 spp.), Diptera (62 spp.), fleas (1 sp.), lice (13 spp.), mange parasites (10 spp.) and cutaneous Filaria (3 spp.).

BAYON (H.). **Leprosy: A perspective of the results of experimental study of the disease.**—*Ann. Trop. Med. Parasit., Liverpool,* ix, no. 1, 18th March 1915, pp. 1–90, 6 plates.

The author states that figures and conclusions show so clearly that contagion or infection through immediate contact is the usual mode of communication of leprosy, that it appears rather far-fetched to seek an insect carrier of this disease. All experiments to prove this mode of transmission have so far failed, though it appears quite probable that the common house-fly can acquire the germs of the disease from open sores, carry them about for several days, and disseminate them.

Leboeuf examined numerous specimens of *Musca domestica* caught on the sores of lepers. He found leprotic "globi" in the intestines of flies captured and kept for twenty-four hours, and acid-fast rods in flies thirty-six hours after feeding. He concludes that *M. domestica* can absorb enormous numbers of Hansen's "bacilli" from sores containing these germs. The "bacilli" can be found in abundance and apparently healthy in the excreta of infected house-flies. Multiplication does not seem to take place in the digestive tract of *Musca domestica*, though there are no signs of degeneration. *M. domestica* possibly plays an important part in the dissemination of leprosy by depositing its excrements on the mucous membranes or small abrasions of the skin of healthy people living in the immediate vicinity of lepers. No insect is yet known to act as the true intermediate host of any bacterial disease. With bacteria, a contaminatory communication through the faeces or by the regurgitation of the crop contents takes place. This is the case in bubonic plague and typhoid. The house-fly is eminently adapted for a contaminatory or mechanical method of dissemination, but the difficulties inherent in the communication of leprosy to animals will render experimental work in this direction very difficult to accomplish.

SCHWETZ (J.). **Preliminary Notes on the Mosquitos of Kabinda (Lomami) Belgian Congo.**—*Ann. Trop. Med. Parasit., Liverpool,* ix, no. 1, 18th March 1915, pp. 163–168.

This paper, to which Mr. H. F. Carter has added the entomological notes, describes the mosquitos of Kabinda, a healthy station about 2,800 feet above sea-level. There are no swamps, and mosquitos are relatively rare and very sensitive to seasonal variations, being more numerous at the beginning and end of the rainy season, when the rains are not excessive. A specimen of *Stegomyia fasciata* was caught and mosquito and Chironomid larvae were easily obtained from water in old tins and other receptacles in both the European and native compounds. A species of *Taeniorhynchus* was common in the houses and *Mansonioides* sp., though rare, was also found in houses. Generally, the larvae of different species are not found in the same receptacle in any great variety, one genus or even species usually predominating. One receptacle, on one day, yielded only *Culex ? duttoni*, Theo., and a week later almost exclusively *S. fasciata*. Of thousands of mosquitos bred, few were Anophelines, 90 per cent. consisting of *Culex* or *Stegomyia*. The following species are recorded :—*Toxorhynchites brevipalpis*, Theo., *Eretmapodites chrysogaster*, Graham, *Anopheles* (*Myzomyia*) *costalis*, Lw., *Culex tigripes*, Gr., var. *fuscus*, Theo. ; 50 per cent. of the mosquitos were species of *Culex*, including *C. duttoni*, Theo., *C. univittatus*, Theo. and *C. invidiosus*, Theo. ; the true *C. pipiens*, L., was not represented ; *Taeniorhynchus cristatus*, Theo., occurred ; and a few *Mansonioides uniformis*, Theo., and possibly some *M. africanus*, Theo., were captured in houses. *Stegomyia fasciata*, F., was very common in and around houses, chiefly towards the evening. *Stegomyia africana*, Theo., *S. apicoargentea*, Theo., *S. simpsoni*, Theo., and *S. poweri*, Theo., were bred, and specimens of *Culiciomyia nebulosa*, Theo. and *Ochlerotatus* (*Protomacleaya*) *alboventralis*, Theo., also occurred in the collection.

CARTER (H. F.). **On some previously undescribed Tabanidae from Africa.**—*Ann. Trop. Med. Parasit., Liverpool*, ix, no. 1, 18th March 1915, pp. 173-196, 8 figs. 1 plate.

With one exception, the new TABANIDAE described, were obtained from the Transvaal or from the West Coast of Africa. Those from the Transvaal, were all taken in the vicinity of Onderstepoort, near Pretoria, and formed part of a collection which also included the following species :—*Tabanus sericeiventris*, Lw., *T. insignis*, Lw., *T. taeniola*, P. de B., *T. ditaeniatus*, Macq., *T. atrimanus*, Lw., *Haematopota scutellaris*, Lw., (?), *Chrysops stigmaticalis*, Lw., and *Diatomineura aethiopica*, Thun.

Tabanus triquetrornatus, sp. n., Calabar, Southern Nigeria ; *T. fuscipes*, Ric., var. *oculipilus*, var. n., Transvaal ; *Haematopota transvaalensis*, sp. n., Transvaal ; *H. theobaldi*, sp. n., Transvaal ; *H. pinguicornis*, sp. n., Gold Coast ; *H. angustifrons*, sp. n., Belgian Congo ; *H. exiguicornuta*, sp. n., Lokoja, N. Nigeria ; *H. corsoni*, sp. n., Gold Coast, are described.

A key to the distinctive characters of seventeen species of *Haematopota* from British West Africa, is given.

ROUBAUD (E.). **Les Muscides à larves piqueuses et suceuses de sang.** [Muscids, the larvae of which bite and suck blood.]—*C. R. Soc. Biol., Paris*, lxxviii, no. 5, 19th March 1915, pp. 92–97, 2 figs.

Though biting and bloodsucking flies are common among the MUSCIDAE, the larvae are, as a rule, incapable of biting or sucking blood. The Calliphorinae however present some curious exceptions, in which the conditions are reversed, in that the larvae can bite and the adults cannot. *Auchmeromyia luteola* is an example of this. The structure of the mouth-parts and the mode of sucking blood are described. Species of *Chaeromyia* are only capable of attacking comparatively hairless animals, and experimentally, man. The larvae of *Phormia sordida*, Zett., (= *P. azurea*, Meig) were shown to attack young swallows in the nest by Dufour in 1844. This has been recently confirmed by H. du Buysson, who has also taken the larvae of *Phormia* freshly gorged with blood in the nests of tits [see this *Review*, Ser. B, iii, p. 97]. The author has succeeded in causing the larvae to bite the bare skin of the guinea-pig and fowl. Rodhain has described a blood-sucking Muscid larva from the nests of *Passer griseus* in the Belgian Congo, which greatly resembled *Phormia sordida* in its habits. All these larvae have the same method of adhesion to the skin by the border of the first postcephalic segment acting as a cupping glass, the scarification of the skin by the buccal hooks, and the negative pressure produced by the movements of the invaginated pseudocephalon. Two conditions are necessary; the skin must be bare or practically so, and the host must be at rest. The author regards this blood-sucking habit as an intermediate stage, in the evolution of permanent cuticular parasitism and it is pointed out that two types of cuticular Muscid larvae correspond with those described. *Cordylobia anthropophaga* is a cuticular parasite of man and mammals, and the larvae of *Mydaea* are parasitic on the woodpeckers of South America [see this *Review*, Ser. B, i, p. 133].

Extermination of Flies and Mosquitos.—*Jl. R. Soc. Arts.*, *London*, lxiii, no. 3255, 9th April 1915, pp. 479–480.

An account from *L'Agriculture Nouvelle* is quoted of experiments made for the extermination of horse flies attacking horses at Noumea, New Caledonia. Cod-liver oil, applied to the infested parts of the animal, is said to kill them immediately and to produce no caustic effect on the skin. It is said to be equally efficacious in the extermination of house-flies, mosquitos and ticks, the effect of the applications lasting from 10 to 18 hours. Mosquito larvae are killed immediately when cod-liver oil is spread on the surface of pools containing them.

Труды совѣщанія бактеріологовъ и представителей врачебно-санитарныхъ организацій по борьбѣ съ заразными болѣзнями въ связи съ военнымъ временемъ. [Proceedings of the Conference of bacteriologists and representatives of medical-sanitary authorities on the campaign against infectious diseases in connection with the War. (Moscow, 10–12 January 1915).] Published by the Society of Russian Physicians in memory of Pirogov, *Moscow*, 1915, 131 pp.

The following papers, bearing on the subject of obnoxious insects, were read at the Conference :—

Postnikov (A. I.). **Къ вопросу о борьбѣ съ вшами въ дѣйствующей арміи.** [On the question of the control of lice in the active army], pp 70–71.

The author states that the Russian army is suffering from *Pediculus humanus* (*vestimenti*), while *P. capitis* and *Pthirus pubis* are less common.

The last two species may be successfully controlled by applying spirit extract of sabadilla, mercury ointment, both the grey and white, solution of corrosive sublimate of a strength of 1 : 250 to 1 : 100, amyl and ethyl alcohol, benzine, choroform, carbon tetrachloride, methane, birch-tar, liquid of Malinin, etc. The control of *P. humanus* is very difficult owing to its ability to withstand some of the above remedies and to its life-history, which makes the application of some of them impracticable. To destroy the parasites in the clothing of troops, only gases must be used, such as the vapour of chloroform, carbon tetrachloride or methane and SO_2. The latter may be applied in the following way : a mixture of tartaric acid and sodium sulphite slightly moistened with water is placed in small linen bags underneath the shirt ; the temperature of the body produces a reaction which continues for two days, giving off a large amount of SO_2 (100 grms of sodium sulphite give 22·4 litres of SO_2) which spreads underneath the shirt and kills all the parasites while not affecting the skin in any way or causing discomfort to the wearer. The author has proved this by experiments on himself. The cost, per man, of 15–20 grms. of the mixture is only a few farthings.

Popov (V. A.). **Паразиты кожи у солдатъ дѣйствующихъ армій, ихъ значеніе и мѣры борьбы съ ними.** [Skin parasites of soldiers of the active armies, their importance and remedies against them], pp. 68–70.

Attention is drawn to the necessity of combating *Pediculus humanus* (*vestimenti*) in order to protect the army and the civil population from outbreaks of spotted and recurrent fever. Frequent bathing and washing of the underclothing is the best preventive remedy against ectoparasites. Soaking linen in birch tar, liquid of Malinin, kerosene, creosote, ether-oils, etc., can also be used as preventive remedies, while, in cases when the clothes and linen are already infested with parasites, they should be subjected to treatment with SO_2, kerosene, liquid of Malinin, birch tar, acetic acid, or the Helios apparatus. Shaving and washing the head, followed by smearing with xylol, kerosene, acetic acid, liquid of Malinin and mercury ointment are recommended against *Pediculus capitis*.

Marzinovsky (E. I.). **Насѣкомыя, какъ передатчики заразныхъ болѣзней.** [Insects, as carriers of infectious diseases], pp. 56–68.

The author illustrates the dangerous consequences, both for the army and the civil population, which may result from the part played by insects in carrying various diseases. He refers more or less fully to *Musca domestica*, which is responsible for carrying typhoid, cholera and other diseases, to *Stomoxys calcitrans*, the bites of which may lead to infection with siberian-sores (anthrax ?) and probably also with erysipelas and epidemic cerebro-spinal meningitis, and to *Anopheles*, in connection with malaria, which may threaten the army on the Caucasian-Turkish front. Prophylactic quinine for the whole army, after March, is urged, and measures should also be taken against *Pediculus humanus*, which carries typhus and recurrent fever, the latter disease, according to some authors, being also carried by *Cimex* *lectularius.* African tick-fever has been also imported into Persia, where it is carried by *Ornithodorus tholosani.* The campaign against infectious disease must include, besides disinfection, the destruction of all insect parasites of man. A number of remedies against *Pediculus humanus* are given, such as Persian powder, naphthaline, sulphur and camphor, which, however, are not always effective ; various ointments, especially those containing white or, better still, black birch-tar, the disadvantage of which is that they soil the underclothing ; quinine or mercury, it being mentioned that the natives in Turkestan carry on their hands and legs bracelets made of threads soaked with mercury compounds ; various ethereal oils, the most effective in keeping the insects away being clove oil, eucalyptus oil, oil of anise and camphor oil ; various soaps, such as tar, sulphur, sabadilla soaps ; the liquids of Malinin, of Gribinyuk, Judin, Odessa-liquid, sabadilla decoction, etc. ; gases, such as carbon bisulphide, SO_2, formaldehyde, hydrocyanic acid, tobacco-smoke, etc. ; treatment under high temperature up to 200° F. In order to destroy the eggs of lice and fleas, fumigation with special lamps must be used. The floors must be washed with kerosene and cracks filled with tar or with a 2 or 3 per cent. solution of antiformin. A good remedy in common use against fleas is dry wormwood leaves. None of the above remedies can be regarded as ensuring radical results, and the best methods consist in treating the linen and clothes in such a way as to prevent the parasites from living on them ; the best method is to soak the linen with a 10 per cent. alkaline solution of [black] birch tar (white birch tar being less effective owing to the absence of smell) ; silk underclothing is also quite satisfactory in this respect. The best kind of disinfecting chamber for army requirements is that used by the Japanese, by which disinfection on a large scale can be carried out. Kummerfeld's wash is useful and is prepared as follows :—20 parts of precipitated sulphur are incorporated in a mortar with 50 parts of glycerine ; 2 parts of camphor are separately ground with 50 of Eau de Cologne and 20 of borax and 870 parts of distilled water are added ; the whole is mixed together and 3 drops of an extract of musk are added, shaking in order to prevent the sulphur from settling down ; 50 parts of ether are added to the mixture.

Jakimov (V. L.) & Shochor (N. I.). **Кожный лейшманiозъ (восточная язва).** [Skin Leishmaniasis (Oriental sore).]—**« Извѣстiя Петроградской Бiологической Лабораторiи.»** [*Bulletin du Laboratoire Biologique de Petrograd*], *Petrograd,* 1915, xv, no. 1–2, pp. 33–36.

This is a brief report of the expedition for the investigation of tropical diseases in Turkestan and of leishmaniasis in Bokhara, Samarkand, Askhabad and Termez (on the Russian Afghanistan frontier). Termez appears to be the focus of the disease. Out of 59 officers, the disease was contracted by 40 (67·8 per cent.), of which number 32 (80 per cent.) fell ill in Temez, 4 (10 per cent.) in Askhabad, 3 (7·5 per cent.) in Samarkand and 1 (2·5 per cent.) in Transcaspia. Of the 32 patients in Termez, 14 (43·8 per cent.) became ill during the first year of their sojourn in the fortress, 11 (34·3 per cent.) during the second year, 2 (6·4 per cent.) during the third, 1 (3·1 per cent.) during the fourth, 3 (9·3 per cent.) during the fifth and 1 (3·1 per cent.) during the seventh year. Of the 36 soldiers attacked in Termez, 29 (80·5 per cent.) fell ill during the first year, 3 (8·3 per cent.) during the second and third years and 1 (2·8 per cent.) during the fifth year. Of 48 patients observed in January, 1 (2 per cent.) fell ill in June, 7 (14·5 per cent.) in July and 40 (83·3 per cent.) in August. Of 28 officers, 10 per cent. contracted the disease in June, 45 per cent. in July, and 45 per cent. in August.

No results were obtained from the investigation of mosquitos which might be regarded as carriers of the disease, nor did the examination of bugs taken from the beds of both healthy men and those affected with the disease, give any positive results.

Sleeping Sickness in the island of Principe.—Despatch from Consul-General Hall-Hall to Sir Edward Grey, dated 19th April 1915. [Received at the Colonial Office 1st July 1915.]

No fresh cases of sleeping sickness have been reported since 27th August 1914 [see this *Review*, Ser. B, ii, p. 206], and a reward of 5 escudos (about 17s.) each has failed to produce a single tsetse-fly since 11th April 1914. The total deaths from the disease during the year 1914 were 59, and it is stated that 8 old cases still remain on the island. A gang of 75 men is still employed in clearing land belonging to native proprietors and the Consul-General says : " It now remains to be seen whether the draining and cleaning of the previous haunts of the fly will be maintained. Should those localities be allowed to lapse into their former state, the survival of a few *Glossina* and some carelessness regarding the entry of infected persons, would be sufficient to cause a recrudescence of the trouble. About two years ago, the problem of ridding the island of the disease appeared to be so difficult, that, as you doubtless recollect, one critic suggested that the island should be abandoned, and the energies of the planters be directed to Portuguese Guinea."

HEWITT (C. G.). **Notes on the Pupation of the House-Fly (*Musca domestica*) and its Mode of Overwintering.**—*Canadian Entomologist, London, Ont.*, xlvii, no. 3, March 1915, pp. 73–78.

Following the experiments carried out by the author in 1914 on the control of the larva by insecticides, it was decided to examine the soil around and beneath an untreated heap of horse manure, with a view to ascertaining the distance and depth travelled by the larvae before pupation. A few puparia were found directly beneath the heap to a depth of 12 inches. The greatest numbers occurred in the region about 18 inches from the heap at a depth of from 12–24 inches ; some puparia were found immediately below the surface. The numbers decreased in proportion to the distance from the heap, disappearing entirely about 4 feet away. In northerly latitudes, *M. domestica* exists in the overwintering period in the following states :—1. *Dormant.* —In cool retreats where there is shelter ; here flies may truly hibernate. 2. *Periodically active.*—In premises where an increased temperature produces activity in the fly which would be otherwise inactive and dormant. 3. *Permanently active.*—The gradation between this and the former state would be governed by temperature and presence of food. 4. *In the immature stages.*—Observations indicate the possibility of such an occurrence in the presence of suitable conditions.

States 1 and 2 are probably the most usual methods of overwintering; state 3 contributes to the number of active flies in early spring. The relative lateness of the season at which house-flies become abundant, may be due to the smallness of the number of individuals which survive the winter in an active condition. The author has been unable to carry the insect through the winter in the pupal state, nor has he been able to find living pupae under outdoor conditions. In more southerly latitudes, *e.g.*, in Florida, the insect has been found in the active adult condition and in various developmental stages during the winter, although the duration of such stages is considerably lengthened.

WHITE (A.). **The Diptera-Brachycera of Tasmania. Part I. Families** LEPTIDAE, STRATIOMYIDAE, NEMESTRINIDAE and CYRTIDAE.—*Papers and Proceedings R.S. of Tasmania for the year* 1914, *Hobart*, 18th March 1915, pp. 35–74, 11 figs.

A blood-sucking Leptid, *Spaniopsis tabaniformis*, sp. n., is described in this paper, which forms the first part of a revision of the Diptera-Brachycera of Tasmania. This fly, which resembles a small *Tabanus* in appearance, was found in Freycinet's Peninsula by Mr. G. H. Hardy, who states that it occurs locally in swarms. It was met with on April 12th and would therefore appear to be an autumn species.

MARLATT (C. L.). **Cockroaches.**—*U. S. Dept. Agric., Washington, D.C.*, Farmers' Bull. no. 658, 27th March 1915, 15 pp. 5 figs.

The best known domestic cockroaches are *Blatta orientalis* and *Phyllodromia* (*Blattella*) *germanica* in Europe, and *Periplaneta australasiae* and *P. americana* in Australia and America respectively. They are almost omnivorous, feeding on dead animal matter, cereal products, woollen and leather materials, etc. The excrement and the secretion of the scent glands possess a characteristic odour which often damages food- stuffs. In Europe, the egg-capsules are often parasitised by an Ichneumon, *Evania appendigaster*, the value of which is, however, lessened by a hyperparasite, *Entedon hagenowi*. Sodium fluoride dusted over hiding places causes the death or stupefaction of cockroaches in a few hours. Borax mixed with chocolate powder, pyrethrum, flowers of sulphur and sweetened flour paste mixed with 1–2 per cent. of phosphorus have all been found to give good results. As fumigants, hydrocyanic acid gas, carbon bisulphide and pyrethrum fumes can be used. Suitable traps can be made from any deep vessel with smooth internal walls containing a small quantity of stale beer or rancid butter.

MACKIE (F. P.). **Insects and Kala-azar.**—*Ind. Jl. Med. Research, Calcutta*, ii, no. 4, April 1915, pp. 942–949.

The probable relationship between kala-azar and some biting insect led to an attempt to make an insect census of the native huts in infected villages. Little information was however gained in this way, and in place of this method, an investigation of domestic vermin, viz., body lice (*Pediculus humanus* and *P. capitis*), bed-bugs (*Cimex* sp.), mosquitos, sand-flies (*Phlebotomus* sp.) and leeches, was carried out.

The insects were caught in the bedding or on the persons of patients suffering from kala-azar ; leeches were allowed to feed on patients whose blood contained *Leishmania donovani* and were examined from 1 to 2 months later. In no case was the presence of the parasite detected in insect or leech which had been allowed to feed on an infected patient, nor were the insects capable of transmitting the disease to monkeys. Nevertheless, the author is of the opinion that further investigation on the relation of sand-flies to the disease would be valuable.

Morison (J.). **The Causes of Monsoon Diarrhœa and Dysentery in Poona.**—*Ind. Jl. Med. Research, Calcutta*, ii, no. 4, April 1915, pp. 950–976, 12 charts, 2 maps.

The inquiry into the causes of diarrhoea and dysentery in Poona, begun in April 1912, had for its object the study of the epidemiological, clinical and bacteriological aspects of the disease. After giving a survey of the physical characters, climate, population, sanitation and water supply of the town, the relation between flies and diarrhoea in 1912, is discussed. To estimate the number of flies and their distribution, collections were made at 30 stations in 1912 and at two in 1913. In 1912, the increase in the number of flies from 29th May till 10th July, coincided with increasing numbers of cases of diarrhoea. From 10th to 31st July, there was a decrease in both, followed by a rise in the number of flies to a maximum on 21st August. Two weeks later the flies had disappeared, while the decrease in diarrhoea was less rapid. Three distinct epidemics occurred after the disappearance of the flies. During August, when flies were most numerous, cases of diarrhoea diminished, and two weeks later, when the flies had disappeared, the number of cases again increased. In May 1913, flies and cases of diarrhoea again increased together. A check in the increase of flies on 4th June, was followed, in the next week, by a temporary diminution in cases of diarrhoea. From 18th June onwards the flies diminished, but the disease continued to increase. In 1912, cases were most numerous in the first week in July, while flies were most plentiful six weeks later ; in 1913, flies were most numerous seven weeks before the cases of diarrhoea had reached a maximum. The evidence, thus, does not support the view that flies were in either year the main cause of the epidemic, while the incidence of the disease in the different regiments does not support the fly theory. Admitting that flies may distribute an infective diarrhoea, the evidence that they convey infection to such an extent as to produce the annual epidemic, is insufficient.

Kellogg (V. L.) & Nakayama (S.). **A New *Trichodectes* from the Goat.**—*Psyche, Boston, Mass.*, xxii, no. 2, April 1915, pp. 33–35, 1 fig.

Hitherto the only Mallophagan found on the domestic goat has been *Trichodectes climax*, but on individuals of the merino goat, in California, another and larger species occurs, described in this paper as *Trichodectes hermsi*, sp. n.

MANN (W. M.). **A Cursorial Tick.**—*Psyche, Boston, Mass.*, xxii, no. 2, April 1915, p. 60.

While travelling in the Sinaitic Peninsula and Arabia Petraea, in 1914, the author observed examples of *Hyalomma aegyptium*, L., living in hummocks formed by sand at the base of the scrubby bushes which mainly comprise the sparse vegetation. By stamping on the ground in the vicinity, they could be induced to emerge and travel at a rapid pace towards the observer.

EWING (H. E.) & STOVER (A. J.). **New Parasitic Mites (Acarina).**—*Entom. News, Philadelphia,* xxvi, no. 3, March 1915, pp. 109–114, 1 plate.

The following new species of parasitic mites are described:—*Haemogamasus sanguineus* on *Mus rattus*, *Liponyssus spiniger* on the musk-rat, *L. crosbyi* on *Vesper subulatus*, and *Proctophyllodes trisetosus* on the meadow lark, *Sturnella magna*.

HORNIG (H.). **Mosquito Extermination Work in Philadelphia, Pa.**—*Entom. News, Philadelphia,* xxvi, no. 3, March 1915, pp. 123–125.

During the summer of 1912, work in connection with mosquito extermination was begun in the southern part of the city, where numerous neglected waterways had become overgrown with vegetation. The removal of reeds, etc., the constant oiling of ditches and filling in of waterholes gave extremely good results. In 1913, extermination work was extended over the whole city. In addition to the delivering of lectures on the life-history of the mosquito, the examination of water-holding receptacles, surface drains and pools was carried on. Sewers were found to furnish a supply of mosquitos from July to November, while breeding in the open air did not continue after October. The temperature of the sewers, 6 feet below the surface, was from 12°–20° higher than that of the outer air. In 1914, extermination work was conducted by the Bureau of Highways. The most efficient work accomplished was the oiling of sewer inlets. An outbreak was observed four weeks after the heavy rain in May 1914. Tanks and fire-buckets in hotels and factories were responsible for infestations in the residential sections. Large colonies of *Culex pipiens* were found in several creeks receiving sewerage; such places were cleared and a better flow of water established. In the southern part of the city a chemical factory discharging waste water into meadows favoured the breeding of salt-marsh species. Larvae of *Ochlerotatus* (*Aedes*) *sollicitans*, *O. taeniorhynchus*, *O. sylvestris* and *Psorophora ciliata* were abundant. A few specimens of *Ochlerotatus jamaicensis*, *O. triseriatus*, *O. canadensis*, *Culex restuans*, *C. salinarius* and *Taeniorhynchus* (*Coquellittidia*) *perturbans* were found. *Anopheles punctipennis* occurred in meadows and near stables, often breeding in the same places as *Culex pipiens*.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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McHattie (A. C. N.). **Medical Report on the Bahamas for 1914,** 51 pp. [Received from Colonial Office 4th June 1915.]

Mosquitos were very prevalent during a great part of the year in spite of the large reduction in the number of breeding places effected by the removal of rubbish. Experiments were made with certain fish indigenous to the island, which were thought to be destroyers of mosquito larvae. These fish were caught in brackish water and fed readily on larvae and the change from brackish to well water did not seem to affect them at all. Further experiments showed that though mosquitos will breed in the brackish water, the larvae have little chance of attaining to maturity, owing to the presence of the fish.

Laurie (D. F.). **Report of the Poultry Expert for the Year 1913-1914.** —*Adelaide,* 1915, 7 pp. [Received 16th May 1915.]

A section of this report deals with the causes of loss and sickness among poultry. The effects of bites of the poultry tick, *Argas persicus,* have been responsible for much mortality, especially in the country districts. This tick is invariably the carrier of *Spirochacta marchouxi* vel *gallinarum.*

Woodcock (H. M.). **Report on Work done at the University of London during the Year ending 30th June 1914.**—*Rept. Advisory Committee Trop. Dis. Res. Fund for 1914, London,* 1915. Appendix ii, pp. 81–86.

This paper deals with flagellates occurring in the common British mosquito, *Culex pipiens,* and with the development of the trypanosome of the Little Owl (*Athene noctua*) in *C. pipiens.*

Alcock (Lt.-Col. A.). **Report of the Entomologist to the London School of Tropical Medicine for the half year ending 31st October 1914.**—*Rept. Advisory Committee Trop. Dis. Res. Fund for 1914, London,* 1915. Appendix iv, pp. 95–96.

From North Borneo, Dr. E. L. Mansel sent a specimen of *Chrysops fixissima* with an account of the effects of its bite upon a strong and healthy European planter. The bite was not painful at the moment, but caused enormous local swellings and eventually gave rise to nausea, malaise, and general prostration, lasting for forty-eight hours. The fly is well known to the natives of the district, who call it "pikat."

From Northern Nigeria, Captain H. D. Foulkes sent a number of *Ornithodorus savignyi* and stated that this tick is found in that country only in sandy districts in the vicinity of Lake Chad, and there chiefly on the sites of old-established markets. The natives who know it as "Girgidi" are said to fear its bite as much as they do guinea worm.

SAMBON (L. W.). **Observations on the Life-History of** *Dermatobia hominis* **(Linnaeus Jun., 1781).**—*Rept. Advisory Committee, Trop. Dis. Res. Fund for 1914, London*, 1915. Appendix vii, pp. 119–150, 4 figs.

Information as to the bionomics of *Dermatobia hominis*, L., obtained in the course of a journey in Colombia, British Guiana and Trinidad, is detailed. The larva of this fly is a common parasite of man in certain regions of Intertropical America. It has been recorded at various times under the names, *Cuterebra noxialis*, Goudot, 1845, and *Dermatobia cyaniventris*, Macquart, 1843. A list of 10 synonyms of this species is given, as well as a full list of English, Spanish and Portuguese popular names, some of which also apply to the larva of *Chrysomyia macellaria*. *D. hominis* is a neotropical Oestrid, ranging throughout tropical America. It chiefly occurs in the wooded tracts of the coastal lowlands and river valleys. The habitat is associated with a warm temperature, a certain amount of surface water, and forest vegetation. The presence of large herds of cattle is an important element in the distribution, prevalence, and spread of this Oestrid, but is by no means essential. It attacks man and domesticated dogs in virgin forests far removed from cattle-grazing grounds, where local wild animals must serve as hosts for the parasitic larval stage. A more important factor in distribution is no doubt the insect associate which appears to be frequently employed by the Oestrid for the conveyance of its progeny to a suitable vertebrate host. This nurse, or carrier, is as a rule a woodland breeding mosquito of the genus *Janthinosoma*. Hitherto the few individuals carrying *Dermatobia* eggs which have been determined, belong to the species *J. lutzi*, which occurs in damp woods and shady river sides, but probably other species with a similar distribution may also be concerned. Imported cases of cutaneous myiasis due to *Dermatobia hominis* have been observed from time to time in New Orleans and other towns, but so far it has not been reported as indigenous from any part of the United States. It is not found on the so-called Mexican plateau, made up of irregular uplands bordered by the two converging sierras, but is more or less plentiful in the warm marshy plains below, from which it was reported as far back as 1653. It is common in man, dogs and cattle on the low-lying coastlands of Central America, and labourers in the Panama Canal suffering from its attacks are frequently admitted to hospital in New Orleans. Cattle suffer seriously from it in the river valleys and coast lands of Colombia and on the low plains east of the Andes; it swarms on the borders of the great forests, as well as in places where both wood and prairie land are present. It is common in Venezuela and well known in Trinidad, but is thought to be absent from the Leeward and Windward Islands, as well from the Greater Antilles. In the Guianas and Brazil *D. hominis* is widely spread and very common. The fly is abundant in Peru, but there is no information as to Paraguay, Argentina, Chili and Ecuador. Cattle are so seriously attacked that the so-called "Rio hides" are of little commercial value. Horses are also attacked, and mules are certainly not immune, as the muleteers in Guatemala squeeze out the warbles and treat the sore with undiluted creolin which they carry for the purpose. The same method is used by the land-owners, but it is possible that *Chrysomyia macellaria* is also largely implicated in these cases. Pigs, goats, sheep and cats are frequently attacked, but all these domesticated animals were first introduced into tropical America from Europe at the beginning of the sixteenth century, and though now important as hosts and reservoirs of the parasite, the original and normal hosts are the indigenous wild fauna. *D. hominis* has been found in monkeys, pumas, the red brocket (*Cariacus rufus*) and in agoutis, in the warty skin of the head and neck of turkeys and in certain species of toucan and ant birds. It was reported to the author in Trinidad that poultry were also attacked, but the birds examined were found to harbour the larvae of *Mydaea pici*, Macq., and not those of *Dermatobia*. The life-cycle of *Dermatobia* is not *per se* markedly periodic, but a certain periodicity is introduced by the effect of seasonal conditions on the mosquito intermediary which carries the larvae to the vertebrate host. According to Folkes (1897), the natives of Guatemala regard it as most prevalent in the rainy season, but he himself thinks it is most numerous just after the rains. Goudot (1842) states that in Colombia it is specially prevalent after protracted rainy seasons. Dr. Paez informed the author that it is more abundant in the plains during and after the rains, but that in the woodlands it occurs in nearly the same numbers all the year round, which increases the probability of transmission by a Culicid. The warbles are generally to be found in man and cattle from March to September, with a maximum in April, June and July, this period corresponding more or less with the rainy season of the fly area in Mexico, Central America and the northern parts of South America. In cattle the warbles are found in the head, sides, tail and along the backbone, but principally about the shoulders, i.e., the parts least accessible to the animal's tongue, horns or tail. In man all exposed parts are attacked, but there is some reason for believing that the larvae are ingested and migrate to the exterior, which would explain their appearance in parts not readily accessible from the outside. In no case is there any evidence that the patient was aware that he had been bitten by the fly, and some reliable observers, though attacked, never had an opportunity of seeing a single specimen of the perfect insect. Direct oviposition cannot however be excluded, for, according to Dr. Lutz, the fly hovers round man, horses or cattle with the ovipositor exserted. In Venezuela the natives believe that the larvae crawl on to the body from the ground; in other places the fly is thought to oviposit on linen which has been left to dry after sunset, and over the whole area there is a belief that the fly oviposits on the leaves of certain plants especially on the borders of narrow paths. The natives, especially in Brazil, attribute the warbles to the bite of a mosquito. The connection with a mosquito was demonstrated by Dr. R. Moralès of Guatemala, in 1911, to whom a collection of mosquitos had been sent. Amongst these was a large species specially labelled as the carrier, from which a larva was successfully introduced into the forearm of an assistant. The work of Drs. M. Nunez Tovar, R. G. Rincones, and J. Surcouf is also mentioned in this connection [see this *Review*, Ser. B. vol. i, p. 106]. The species most commonly selected as a carrier of the eggs is *Janthinosoma lutzi*, Theo., but it is more than probable that other species and even other Diptera may at times serve the purpose. The time of residence of the larva in the skin of the host is variable, and such evidence as there is, points to a period of 3 to 6 months. A full description of the warbles and of the symptoms produced is given, together with an account of various methods of treatment. No special method of prevention is known, but cow-birds (*Molothrus*), tick birds (*Crotophaga*) and others should be protected. It is also strongly urged that the attempt to improve local stock by animals imported from abroad may result in the destruction of valuable immunities and adaptations which have taken centuries to become established. A lengthy bibliography concludes this paper.

MACFARLANE (H.). **Reports on Work carried out in Colonial Laboratories.**—*Rept. Advisory Committee Trop. Dis. Res. Fund for 1914, London,* 1915. Appendix viii, p. 189.

A collection of the Tabanidae of Hong Kong, started originally by Mr. Adam Gibson, M.R.C.V.S., Colonial Veterinary Surgeon, and carried on jointly with the author, has been undertaken. One thousand five hundred and eight specimens have been forwarded to the Director of the Imperial Bureau of Entomology and a preliminary list dealing with 395 of these has been received, which includes the following species :—*Chrysops dispar*, F., *C. striata*, Wulp, *Tabanus crassus*, Walk., *T. ditaeniatus*, Macq., *T. hilaris*, Walk., *T. hybridus*, Wied., *T. indianus*, Ric., *T. jucundus*, Walk., *T. negativus*, Ric., *T. sanguineus*, Walk., *Tabanus* sp. nov., near *birmanicus*, Big., and *Tabanus* sp. nov., near *inobservatus*, Ric.

GRAY (C. E.). **Veterinary Division: Annual Report 1913-14.**—*Rept. Union of South Africa Dept. Agric. for the year 1913–14, Capetown,* 1915, pp. 37–139, 9 tables.

The attempt to check the progress of East Coast fever has been continued throughout the year. In the Cape Province, dipping tanks have been established in several localities and the movements of cattle restricted to a certain degree. Although the efforts to control the disease have met with considerable success, the Province is still in a precarious position, owing to the presence along its border of an extensive native area in which the disease is prevalent. In the Transvaal, except in the district of Piet Retief, considerable progress has been made. During the year, 41 farms have been removed from quarantine and only 14 fresh outbreaks have occurred. New dipping tanks have been used by Europeans and natives, with gratifying results. The construction of tanks in Natal has been actively carried on. The Government has been empowered to establish tanks on the holdings of absentee owners. Zululand presents the greatest difficulties ; an enormous area occupied by natives has become so thoroughly contaminated that it is difficult to determine whether any particular spot has become clean by lapse of time or whether the disease is still smouldering there ; added to this, the use of immune animals for transport purposes has contributed to the uncertainty of the position. Steps have been taken to provide dipping facilities for natives. Work in the Transkei has been difficult owing to the great area of land occupied by native population. The whole of the low-lying and coastal districts have been overrun with the disease.

Only in parts occupied by Europeans is the work of combating its spread carried out with any thoroughness. Inoculation operations have decreased in number ; in the opinion of the author, this form of treatment should be entirely replaced by dipping.

The life-history of *Psoroptes communis* (sheep scab parasite) has been investigated. The maximum length of time that a female example lived on a sheep was 40 days. The eggs hatched in 48 hours when in direct contact with the skin of a sheep ; when placed on top of a thick crust, they remained from 3 to 4 days without hatching ; when placed in the wool 6–8 days was required. Eggs kept for 10 days away from a sheep, failed to hatch when returned to the normal host ; similarly eggs stored in moist sheep faeces for 13 days did not hatch when returned to the sheep. Eggs could not stand exposure to sunlight. The larvae transformed into nymphs 4 or 5 days after hatching ; when removed from a sheep the larvae lived 2 or 3 days. The nymphs became mature on the 5th day ; pairing occurred on the 6th day at Pietermaritzburg and on the 7th and 8th days at Onderstepoort. Egg-laying began 9 or 10 days after hatching.

Experiments were conducted in Natal to test the efficiency of a more dilute arsenical dip against ticks infecting working oxen. No definite conclusion had been reached at the end of 1913.

HEWITT (C. G.). **House-Fly Control.**—*Agric. Gaz. Canada, Ottawa*, ii, no. 5, May 1915, pp. 418–421.

These notes are primarily intended as a guide in planning anti-fly campaigns. Stress is laid on the necessity of undertaking control work early in the season. Rules for the prevention of breeding and of infection are given, and it is pointed out that education is the most important factor in the campaign. The attitude which regards health as a civic asset, will enable proper sanitary legislation to be enacted. Horse manure is the chief breeding place of the house-fly, and in dealing with the rural problem it is noted that storing manure reduces its manurial value, and that the most effective insecticidal substance for manure is borax in the commercial form, used either dry or in solution [see this *Review*, Ser. B, ii, p. 178].

OLIVEIRA (M. R. de). **Carraças.** [Ticks.]—*Boletim de Agricultura, Depart. Agric. Prov. de Moçambique, Lourenço Marques*, nos. 1–3, January-March 1915, pp. 43–50, 3 plates. [Received 3rd August 1915.]

This is a general account of ticks, the damage done by them and the methods best adapted for controlling them. The author divides ticks into three groups, according as they require one, two or three hosts for the completion of their life-cycle. As examples of each group, *Amblyomma hebraeum*, *Rhipicephalus evertsi* and *Margaropus annulatus* var. *decoloratus* are described and figured, and an account of their life-history is given. The necessity for systematic dipping and the possibility of practically ridding the country of a pest which causes great loss to cattle-owners is emphasised. It is suggested that the introduction of foreign cattle should be prevented.

WATERSTON (J.). **Notes on Siphonaptera in the Albany Museum, Grahamstown, South Africa, with descriptions of two new species of the Genus *Ischnopsyllus* (*I. isomalus* and *I. grahami*).**—*Records Albany Mus., Grahamstown*, iii, no. 2, 1st May 1915, pp. 107–119, 5 figs.

The following fleas, which all appear to be widely distributed in South Africa, are recorded, together with their hosts :—*Xenopsylla cheopis*, Rothsch., on *Damaliscus pyrargus*, Pall.; *Xenopsylla nubicus*, Rothsch., and *Ischnopsyllus isomalus*, sp. nov., on *Miniopterus* sp., and *Rhinolophus augur*, K. And.; *Ischnopsyllus grahami*, sp. nov., on *Eptisicus capensis*, Smith; *Chiastopsylla rossi*, Waterst., on *Crocidura flavescens*, Is. Geof.; *Chiastopsylla rossi*, Waterst., on *Otomys irroratus*, Brants, *Mus rattus*, L., and *Mystromys albicaudatus*, Smith; *Listropsylla agrippinae*, Rothsch., *Dinopsyllus ellobius*, Rothsch., *Leptopsylla musculi*, Dugès, and *Echidnophaga gallinacea*, Westw., on *Mus rattus*, L.

DUNN (L. H.). **Observations on the Preoviposition, Oviposition and Incubation Periods of *Dermacentor nitens* in Panama (Arach., Acar.).**—*Entom. News, Philadelphia*, xxvi, no. 5, May 1915, pp. 214–219.

In January 1913, a horse in Panama was found to be infected with *Piroplasma caballi*. This is the first record of this piroplasma in the New World, and in view of its probable transmission by the horse-tick, *Dermacentor nitens*, observations were made on the bionomics of this species. Larval ticks, after hatching, attach themselves to a suitable host, upon which they undergo two moults. After the second, the adult stage is reached ; the female, after copulation and becoming engorged with blood, drops to the ground to deposit eggs. This species nearly always adopts horses and mules as hosts, the ears being the special place of attachment. In the ticks under observation, the preoviposition period varied from 5 to 7 days, and the oviposition period from 8 to 16 days. The largest number of eggs deposited in one day was about four hundred. Incubation lasted from 25 to 27 days, with an average minimum temperature of 74° F. Eggs deposited first seem to require a longer incubation period than those deposited later. Further observations on this subject are being carried on.

HUTCHISON (R. H.). **A Maggot Trap in Practical Use; an Experiment in House-Fly Control.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 200, 4th May 1915, 15 pp., 4 figs., 3 plates.

In the experiment carried out by the author at Maryland Agricultural College, three lines of observation were followed :—(1) The collection and estimation of larvae caught in the trap and subsequent search for puparia in the manure ; (2) the counting of flies to determine any decrease in numbers ; (3) the determination as to whether flies at the college came from breeding grounds other than manure at the college stable. The trap consisted of a concrete floor 22 feet long by 12 feet wide ; around this was a rim of concrete 4 inches high. A pipe from one corner led into a small cistern. Standing on the floor of the concrete basin was a wooden platform 20 feet by 10 feet, supported on legs 1 foot high. The boards forming the top of the platform were 1 inch wide and were placed 1 inch apart. On and after 25th July each day's production of manure was placed on the platform ; the height of the heap thus formed was kept at from 3½–4 feet. The manure was sprinkled every day with enough water to moisten it thoroughly. Water was run into the concrete basin to a depth of ½ inch. Larvae migrating from the manure dropped into the water below and were drowned. At least once a week, the water was drawn off into the cistern and the number of larvae estimated. The results obtained during August and September seemed to show that at least 98 per cent. of the larvae were destroyed. An examination of the manure on the platform after 1st October showed the presence of a few scattered puparia and two typical nests. There was no evidence that larvae ever migrated from the fresher to the older parts of the manure to pupate. Old manure does not seem to serve as a breeding place for flies. This is probably due to the decrease in air spaces and the abundance of carbon dioxide and methane. The composition of the gases may be one of the factors which influences migration. Fly counts made before and after the trap was installed, indicated an average reduction of from 67 to 76 per cent. That the reduction of flies did not correspond with the percentage of larvae destroyed was probably due to the presence of several other breeding places within the range of flight. Two difficulties were experienced in the practical working of the trap, viz., the accumulation of débris on the floor under the platform and the breeding of mosquitos in the water used to drown the fly larvae. Low air temperatures were found to hinder migration and consequently to decrease the efficiency of the trap. Among the merits of the trap are the small initial cost and small amount of labour required for its operation and its adaptibility for use in stables where the daily production of manure is large. It is suggested that conditions which tend to preserve the value of the manure, i.e. exclusion of air and increase of water content, are the same as those which render the trap most effective by securing the greatest percentage of migration.

CHITTENDEN (F. H.). **Harvest Mites, or "Chiggers."**—*U. S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 671, 26th May 1915, 7 pp., 3 figs.

The larval form of the harvest mite of the genus *Trombidium* causes great annoyance in the more southern portions of the Central States. Soon after the larvae, which are microscopic, burrow under the human skin, a small red spot appears. The maximum poisonous effect is not usually felt until the second day. Permanent residents in infested regions become immune, either by a toughening of the skin by exposure, or by innoculation due to frequent infection. Harvest mites are abundant in damp localities, along the borders of streams and on the edges of woodland. They are most abundant in the tropics and become less numerous towards the north. In North America, they are generally distributed in the Gulf States, up the Mississippi River to Missouri, and through the Atlantic States to New Jersey. The eggs are deposited on the ground. The larva, after hatching, becomes attached to its host. After feeding, it drops off and seeks shelter. In a few weeks, the adult emerges and is predaceous, feeding on Aphids, small caterpillars or eggs of grasshoppers. It hibernates in the soil and in spring deposits its eggs. The application of hot water containing salt or strong soap to the affected places removes any ill effects. Where exposure is unavoidable, flowers of sulphur rubbed over the legs and ankles is most satisfactory. Alkaline solutions applied liberally serve to counteract the acid poison. The removal of mites from the field can be partly accomplished by cutting all useless grass, etc., and dusting with flowers of sulphur or spraying with dilute kerosene emulsion. Sheep on severely infested tracts are useful, since they crop the grass close, and probably many mites are killed by the oil in the wool.

BEZZI (M.). **Ditteri raccolti nella Somalia italiana meridionale.** [Diptera collected in Southern Italian Somaliland.]—*Redia, Firenze*, x, pts. 1–2, 20th May 1915, pp. 219–233, 1 fig.

This paper deals briefly with the Diptera collected in Southern Italian Somaliland in 1913 by the Stefanini-Paoli expedition. The species mentioned include:—*Pangonia magrettii*, Bezzi, *Adersia* (*Melissomorpha*) *oestroides*, Karsch, *Haematopota* (*Chrysozona*) *albihirta*, Karsch, *Tabanus africanus*, Gray, *T. sericeiventris*, Lw., *Sarcophaga hirtipes*, Wied., *S. haemorrhoidalis*, Meig., *Cordylobia anthropophaga*, Blanch., *Pycnosoma marginale*, Wied., *P. albiceps*, Wied., *Lucilia sericata*, Meig., *Glossina pallidipes*, Aust., *G. longipennis*, Corti, *Hippobosca maculata*, Leach, *H. camelina*, Leach, *H. capensis*, von Olfers, and *Raymondia huberi*, Frauenfeld.

APSIT (J. G.). **Удаленіе мухъ изъ конюшенъ, коровниковъ, и т. п.** [The driving out of flies from stables, cow-yards etc.] – **«Хуторянинъ.»** [*Chutorianin*], *Poltava*, xx, no. 13, 11th April 1915, pp. 312–313.

Smearing the walls and ceilings of stables and yards with a mixture of milk of lime and potash alum is recommended against flies.

PLIGINSKY (V.). **Истребляйте мухъ!** [Kill the flies!]—Leaflet no. 2, published by the Entomological Bureau of the Zemstvo of the govt. of Kursk, *Kursk*, N.D. [Received 22nd June 1915.]

The dangers arising from the presence of house-flies are popularly described. Dusting with chloride of lime and iron sulphate (20 per cent.) or watering all heaps of manure, refuse, etc., with a solution of potassium permanganate (1 tablespoonful in 8 gallons of water) are recommended. The destruction of flies in houses by means of fly papers, etc., and the use of gauze nets in windows are also urged.

OUZILLEAU (F.). **Rapport d'ensemble sur la maladie du sommeil dans le Bas-M'Bomou (1912-1913).** [Report on Sleeping Sickness on the Lower Mbomu, 1912–1913.]—*Bull. Soc. Path. Exot., Paris*, viii, nos. 3 and 4, March and April 1915, pp. 138–154 and 178–198, 1 map.

The first part of this paper is occupied by a detailed description of the flora and fauna, geology, ethnology, etc., of the area dealt with.

This comprises the country on the northern boundary of the Belgian Congo along the Ubangi and Mbomu Rivers, and between their northern tributaries, the Kotto and the Uara, between 4° and 8° N. Lat. and 19° and 23° E. Long., which is roughly about 350 miles square. The three principal tribes are the Yakomas on the Ubangi and the Mbomu Rivers to the south-west, a large area in the centre inhabited by the Nsakara, and the Sandes or Niam-niam to the east and north-east. The Yakoma population is dense and largely employed by Europeans, and sleeping sickness is rife amongst them. The Nsakara country is also densely populated along certain lines at a distance from the Mbomu River, but the people are relatively healthy and sleeping sickness is entirely absent, while to the east the Sande country has been decimated by the disease. Long continued tribal fighting has caused the people to live in a type of hut so constructed for defence that ventilation is practically impossible. The epidemic began about 1900, and has raged more or less ever since, spreading into the Egyptian Sudan. Just before the disease broke out in Sande, a very fatal epizootic occurred among the local buffaloes and in some places spread to antelopes, monkeys and domestic animals, and the natives firmly believe in a relationship between this outbreak and the sleeping sickness, which immediately followed it. Attention is called to the importance of preventing the spread of the disease to the Nsakara country, which is thus placed between two serious centres of infection, and the danger is greatly increased by the fact that the natives of the infected area provide a large portion of the labour employed by Europeans and travel considerable distances. In the Yakoma country species of *Glossina* are rare, though *G. palpalis* is to be found in the forest which here and there lines the banks of some tributaries of the Ubangi. With the exception of these very limited areas, *Glossina* is not found; none were seen in the villages near the banks, and they were never met with on the river itself. *Stomoxys* was also comparatively scarce, but TABANIDAE and mosquitos swarmed. *Mansonia* sp. was specially abundant in certain villages where the disease was prevalent and in the marshy plains. Anophelines were very much rarer and *Stegomyia* was never found. Along the Rivers Chinko and Vovodo and their branches flowing southwards to the Mbomu as far north as the sixth parallel, *G. palpalis* is everywhere to be found. In the Semongo district, where sleeping sickness has raged since its importation from Rafai, no *G. palpalis* are to be found, and the disease is probably maintained by *G. morsitans*. *Culex* and *Mansonia* are by no means rare, and further up the river *Mansonia* is so abundant that the inhabitants are compelled to adopt a special form of hut. The population thus lives under very crowded conditions and this, in the author's opinion, greatly assists the spread of the disease. The percentage of persons attacked by the disease is calculated at 40 for the western centre (Yakoma) and 20 for the eastern. In the former area the epidemic has existed for 6 or 7 years and 15 to 18 years in the latter. The same biting insects are found in the central Nsakara area, where the disease does not exist, as in the others, *G. palpalis* occurring along the rivers in the centre and to the south, and *G. morsitans* in the more northern parts. Mosquitos are not very numerous and are represented by species of *Mansonia* and *Anopheles*. Other biting insects are *Stomoxys* and Tabanids. *Simulium* is very common along the Mbomu and also small midges, probably *Ceratopogon* sp. *Haematopota* spp. are abundant in the open game country; *Chrysops* occurs, but is nowhere common. The rarity or complete absence of *Glossina* in the areas most stricken by the disease is remarkable. These flies are only known to the men who travel to some distance from the locality and are quite unknown to the women and children, who remain at home, and yet all are equally infected. The disease is described as attacking one or more groups of huts at a time, the population of the whole village being ultimately entirely wiped out. The author says that it is quite clear that species of *Glossina* are not responsible for these disasters and play no part in the family contagion. The great marshy plains around Ali in the Sande country are in no sense good breeding places for tsetse, which indeed are not to be found there. Mosquitos, however, swarm, and the author is of opinion that, though the endemicity of the disease may be dependent on *Glossina*, the epidemicity is due to mosquitos. He cites the work of Heckenroth and Blanchard and of Roubaud and Lafont on the transmissibility of trypanosomes by *Mansonia* and *Stegomyia* [see this *Review*, Ser. B, i, p. 191, and ii, p. 58] in support of this view

HUNTER (W. D.). **Some observations on Medical Entomology.**—*Proc. Entom. Soc. Washington, Baltimore,* xvii, no. 2, June 1915, pp. 58–69.

The blood-sucking habit of certain insects is the basis for the transmission of the majority of insect-borne diseases. Among the inter-relations which are probably concerned with this is the habit of certain parasites in man and other animals to swarm in the peripheral blood during the time when nocturnal insects are active and the host is least fitted to interfere with their attack. A consideration of importance is what may be termed domesticity, especially in the case of yellow fever, kala-azar and Chagas' disease. The closer the association between any insect and man, the greater will be the likelihood of disease transmission, provided other necessary conditions are fulfilled. Domesticity does not act as an important factor in tsutsugamushi and spotted fever; the former occurs in wild rodents and reaches man through a mite, *Trombidium akamushi*, which attacks him when he goes into the fields; the spotted fever tick probably acquires the virus of spotted fever from certain wild animals. Another class of diseases may be due to the accidental contact with the pathogenic organism (instead of natural contact as in spotted fever), or accidental contact with food. Cockroaches may in this way become connected with tuberculosis or similar maladies. In some cases, as in *Oscinis* sp., transmission may be by insects which become contaminated by feeding upon or visiting the excreta of affected individuals. The last class of cases consists of those in which insects serve as intermediate hosts for Cestode or Nematode parasites; the larva of a Scarabaeid beetle acts as an intermediate host for *Echinorynchus hirundinaceus*, parasitic in pigs. The cysticercus stage of *Hymenolepsis diminuta*, a Cestode parasitic in man, may be carried by species of *Pyralis*, *Anisolabis*, *Ascis* and *Scaurus*. The most interesting case of disease due to direct attack is tick paralysis. The attachment of the tick causes progressive paralysis, until all parts of the body are involved. Experiments have shown that the disease is not infectious. Investigation of beriberi has thrown much light on effects of various toxins on the system. Observations on the larvae of *Gastrophilus* sp. seem to show that the presence of insects in large numbers in food may result in the formation of toxins, or may produce the destruction or reduction of the so-called vitamines. Among bacterial pathogenic organisms transmitted by insects are those causing anthrax, bubonic plague and typhoid. In the case of protozoan parasites causing malaria, sleeping sickness, nagana, etc., the insect acts as an intermediate host. Among Nematodes, species of *Filaria* are transmitted by insects ; there is probably a connection between a Nematode carried by cockroaches and carcinomatous lesions in the internal organs of mice. The disease of dogs caused by the Cestode, *Diphlydium caninum*, is transmitted by fleas. Mites, ticks, Diptera, Hemiptera, Siphonaptera, and occasionally Lepidoptera and Coleoptera may be concerned in disease transmission. Various relations exist between disease organisms and the insect host, among them being the mechanical and special or obligatory relations. Methods of infection are the sucking of blood and its regurgitation, the contamination of food, and possibly the secretion of specific toxins. Although the majority of insect-borne diseases are endemic in tropical and sub-tropical regions, exceptions occur in typhus fever, spotted fever of the northern part of the United States, tuberculosis and pneumonia. The study of the diseases is at present hampered by a lack of knowledge of the insects involved. For example, very little is known of the PSYCHODIDAE, which may transmit pappataci fever. The vital importance of entomological knowledge has recently been shown in the case of an equine disease caused by *Trypanosoma hippicum*, believed to be transmitted by ants.

KRAMER (S. D.). **The Effect of Temperature on the Life Cycle of** ***Musca domestica*** **and** ***Culex pipiens***.—*Science, Philadelphia*, xli, no. 1067, 11th June 1915, pp. 874–877, 2 tables.

In the series of experiments carried out by the author, an effort was made to eliminate all factors except that of temperature. Individual variations among different batches of eggs were eliminated by dividing the same batch into three parts to be incubated at the three temperatures. Larvae reared from the batches of eggs compared, were fed on the same food. The light was diffused or absent. By exposing several tumblers of water in each incubator, the atmosphere was kept in a high state of saturation. Incubation was carried out at temperatures of 20°, 30° and 35° C. for *M. domestica* and at 20° C., room temperature, and 30° C. for *Culex*. Records were made of the date of appearance of larvae, pupae and adults. In the case of *M. domestica*, results showed that a rise of 10° (from 20° to 30° C.) practically halved the period between the egg and adult stages, while a further rise of 5° shortened it still further by about two days. Similar results were obtained in the experiments with *C. pipiens*.

EDWARDS (F. W.). **On the British Species of *Simulium*.—i. The Adults.**—*Bull. Entom. Research, London*, vi, 1st June 1915, pp. 23–42, 6 figs.

The genus *Simulium* is important on account of the blood-sucking habits of some of its members and the supposed connection between these and pellagra. After giving an account of the general morphology of the genus, the author describes in detail the British species.

S. ornatum, Mg., is common wherever running water is available. The dates of capture range more or less continuously from the 13th March to 20th August. It is doubtful whether this species is a blood-sucker. *S. reptans*, L., is a troublesome blood-sucking form, occurring abundantly in the Abernethy forest in June and July. *S. tuberosum*, Lndst., has similar habits and appears to increase rapidly year by year. *S. argyreatum*, Mg., appears from April to June and again in August. It is a habitual blood-sucker, and it is noteworthy that in the localities in which it has been recorded no running water is present. *S. equinum*, L., has been frequently found on horses, causing ulceration of the ears. It appears to have the same habits outside Britain. The eggs of this species are deposited under water on the submerged parts of plants. *S. hirtipes*, Fries, is reported to have blood-sucking habits. *S. variegatum*, Mg., is confined to comparatively high altitudes, where to a large extent it replaces *S. ornatum*. *S. morsitans*, sp. n., occurs from April to August. It is a blood-sucker and is found in the South of England and in Scotland. The dates of capture of *S. austeni*, sp. n., range from 23rd April to 22nd May. *S. latipes*, Mg., appears from early April until the beginning of September, being most abundant in April and May. The males have been taken hovering in clouds in the shade. The absence of any records of its biting would seem to prove that it is not a blood-sucker. Specimens of *S. aureum*, Fries, have been captured from 31st March to 15th August; its habits are probably identical with those of *S. latipes*. The time of appearance of *S. angustipes*, sp. n., is from March to October. It is mainly a lowland or coast species, often associated with *S. latipes*, which it probably resembles in habit. *S. subexcisum*, sp. n., is found from April to June; it is widely distributed in England and Scotland, though scarce in any one locality.

HIRST (S.). **On a widely distributed Gamasid Mite (*Leiognathus morsitans*, sp. n.), parasitic on the domestic Fowl.**—*Bull. Entom. Research, London*. vi, 1st June 1915, pp. 55–58, 3 figs.

Leiognathus morsitans, sp. n., has a wide distribution in Africa, and is found also in Mauritius, China, India and South America. This parasite probably transmits spirochaetosis. Instances of this mite attacking man are recorded from Zanzibar and India. Descriptions of the adults of both sexes and of the protonymph are given.

LAMBORN (W. A.). **A Preliminary Report on the Problem of Controlling *Glossina* in Nyasaland.**—*Bull. Entom. Research, London*, vi, 1st June 1915, pp. 59–65, 3 tables.

The first aim of the author was to discover a small isolated fly area or primary fly centre, with a view to carrying out experiments in the clearing of bush and endeavouring to reduce the numbers of the fly by systematic capture on a large scale. The district examined was part of the proclaimed area near the western shore of Lake Nyasa at Domira Bay. Observations have shown that there is no evidence of the natural splitting of the northern portion of the fly area in the dry season into two small localised patches, though two large areas do exist as a result of the subdivision of one larger one by native clearings; in the southern part, examined after a few scanty rains, the two so-called primary centres were continuous with each other and with the northern part of the area. Fly is undoubtedly more concentrated in Nyasaland in the dry season than in the wet, coincident with the greater concentration of the game which then takes place. The radiation which follows the scattering of the game after the dry season is, in the author's opinion, too extensive to make practicable any attempt at clearing and reducing the numbers of the fly by systematic capture. Preliminary experiments have been conducted to determine the range of flight of *G. morsitans.* Evidence has been obtained of ten flights of five miles and of one flight of ten miles back to the locality from which the flies were originally taken. The flies recaptured were all taken at the edge of the fly area. Considerable attention has been devoted to the fossorial wasps of the genus *Bembex* as being possibly natural enemies of *G. morsitans.* Flies of the family BOMBYLIIDAE, some small species of which exist in great numbers in the Lingadzi district, have also been under consideration as potential enemies. An endeavour to feed the flies on the larvae of a Saturniid moth met with negative results. A new fly area has recently been reported in the Marimba district of Nyasaland; this district possesses for the most part a dry, sandy soil and is thinly populated. Tsetses are especially attracted by moving objects, and several flies will often travel on or near a person for considerable distances without attempting to bite. An examination of such individuals showed that they were all males.

The *Stegomyia* Survey in Hong Kong.—*Bull. Entom. Research, London,* vi, 1st June 1915, pp. 67–68.

In view of the possible introduction of yellow fever into the Far East, the Government of Hong Kong has instituted an investigation of the mosquitos of the Colony. The following is a list of species found up to the present time:—*Anopheles indiensis,* Theo., *A. jeyporensis,* Theo., *A. karwari,* James, *A. maculatus,* Theo., *A. minimus,* Theo., *A. rossi,* Theo., var. *indefinitus,* Ludl., *A. sinensis,* Wied., *A. tessellatus,* Theo., *Stegomyia fasciata,* F., *S. scutellaris,* Wlk., *S. w-alba,* Theo., *Armigeres obturbans,* Walk., *Ochlerotatus macfarlanei,* Edw., *O. togoi,* Theo., *Culiciomyia pallidothorax,* Theo., *Culex bitaeniorhynchus,* Giles, *C. concolor,* R. D., *C. fatigans,* Wied., *C. fuscocephalus,* Theo., *C. mimeticus,* Noë, *C. sinensis,* Wied., *C. sitiens,* Theo., *C. tritaeniorhynchus,* Giles, *C. virgatipes,* Edw., *C. vishnui,* Theo., *Ficalbia minima,* Theo., *Lophoceratomyia minutissima,* Theo., *L. rubithoracis,* Leic., *Mansonioides uniformis,* Theo., *Micraedes malayi,* Leic., and *Uranotaenia macfarlanei,* Edw.

Stegomyia scutellaris is probably the commonest mosquito in Hong Kong. During the summer it breeds abundantly in Chinese houses in small collections of water in tins, etc., and it is also found away from houses. *S. fasciata* was taken in large numbers from stored clean water used for drinking, etc., but it is unusual to find this species breeding in receptacles in the same way as *S. scutellaris*. The larvae have a habit of going to the bottom when the water is disturbed, which renders them liable to be overlooked in large tubs. The results so far obtained in Kowloon indicate that if the storage of clean water could be completely done away with by laying on a continuous tap supply in the houses, the chief breeding places of *S. fasciata* would be destroyed. In Victoria, where tap water is laid on in the houses, only three cases have been reported in which *S. fasciata* larvae have been found. No larvae were found on the junks and Chinese cargo lighters in this district.

WATERSTON (J.). **Chalcidoidea bred from *Glossina morsitans* in Northern Rhodesia.**—*Bull. Entom. Research, London*, vi, 1st June 1915, pp. 69–82, 5 figs.

In connection with investigations into the life-history, etc., of *G. morsitans* in Northern Rhodesia, special efforts have been made to secure parasites of the fly. As a result, a number of Chalcidoids have been bred from puparia, of which the following species are described or recorded :—*Stomatoceras micans*, sp. n., *Anastatus viridiceps*, sp. n., and *Syntosmophyrum glossinae*.

The other recorded parasites of *Glossina* are : The Mutillid, *Mutilla glossinae*, the Proctotrupid, *Conostigmus rodhaini*, and the Bombyliid flies, *Thyridanthrax abruptus* and *Villa lloydi*

NUTTALL (G. H. F.). **Experimental Drug Treatment of East Coast Fever of Cattle.**—*Parasitology, Cambridge*, viii, no. 1, June 1915, pp. 56–87, 1 fig.

The animals used in these experiments were infected by means of ticks (*Rhipicephalus appendiculatus*), which had fed on infected cattle as larvae and nymphs and were placed on the experimental animals as nymphs and adults respectively. Various drugs were tried, but none was found which would influence the fatal course of East Coast fever or retard the multiplication of *Theileria parva* in the blood of the affected cattle.

WILLIAMS (T. H.). **Report of Live Stock and Brands Department.**—*Rept. of the Minister of Agriculture of South Australia for the year ended 30th June 1914, Adelaide*, 1915, pp. 72–76.

Large numbers of sheep were infected with lice and ticks, and the loss of wool and condition was heavy. The lice were found as far north as Melrose, and there is evidence that they have gained a strong hold in flocks along the Murray Valley. Rams, chiefly of the long wool variety, have been instrumental in spreading lice throughout the State.

Corbett (H. H.). **Undesirable Insect Aliens at Doncaster.**—*Naturalist, London*, no. 701, June 1915, p. 209.

The following species of insects were found on hides imported from India:—Dermaptera: *Apterygida arachides*; Orthoptera: *Phyllodromia germanica*; Coleoptera: *Carpophilus mutilatus, Laemophloeus ferrugineus, Necrobia rufipes, Alphitobius diaperinus, A. piceus*, and *Tribolium ferrugineum*.

Sergent (Edmond) & Sergent (Etienne). **Etudes Epidémiologiques et Prophylactiques du Paludisme; Onzième et Douzième Campagnes en Algérie en 1912 et 1913.** [Studies in the Epidemiology and Prophylaxis of Paludism; 11th and 12th campaigns in Algeria in 1912–1913.]—*Ann. Inst. Pasteur, Paris*, xxix, no. 5, May 1915, pp. 249–257.

Malarial fevers were not very prevalent in Algeria in the period dealt with. The local character of the disease and its dependence upon a supply of chronic untreated cases on the one hand, and the range of flight of Anophelines on the other, is pointed out and isolated epidemics are recorded. The preceding winters were drier than usual and the water supply was very limited, which contributed largely to the reduction of mosquito infested areas. New ones however arose, owing to the lowering of the level of lakes hitherto healthy, and their conversion into marshes and pools. At Palikao, a lake became a breeding ground for mosquitos from another cause. As it was used as a source of drinking water for the inhabitants, it was cleaned and weeded every year, but in 1913 the work was not done, and the reeds and water-weeds grew so vigorously that more than half the surface was covered by them, houses near the lake were invaded by Anophelines and cases of fever quickly followed. *Anopheles turkhudi*, List., (*Pyretophorus myzomyifacies*, Theo.) has been found almost at sea-level at a few yards from the waves, in the fresh water trickling from the chalk-marl cliffs. It was observed in 1912 that the trains on the line which skirts the Macta marsh or on that which runs along the shore of Lake Fetzara collected clouds of Anophelines, which were thus carried long distances. *A. turkhudi* has also been found in Morocco and in one place a variety of *A. chaudoyei* [which is another synonym of *A. turkhudi*]. *A. maculipennis* is found all over Morocco. It is stated that at Montebello, once one of the most malarious places in N. Africa, not a single fresh case has occurred since 1904, when the destruction of larvae and the use of quinine was first undertaken systematically. Similarly good results have been obtained at Mondovi near Lake Fetzara, but gauze screening had to be largely employed to prevent the swarms of mosquitos from the lake from entering the offices and official residences. The railways and the railway staffs are the subject of special anti-malarial measures which have been very successful.

Laveran (A.). **Des Lacertiens peuvent-ils être infectés par des Leishmania?** [Can lizards be infected with leishmaniasis?]—*Bull. Soc. Path. Exot., Paris*, viii, no. 3, 10th March 1915, pp. 104–109.

According to Sergent, Lemaire and Senevet, *Tarentola mauritanica* (the Algerian gecko) may play a rôle in the transmission of oriental sore by *Phlebotomus minutus* [see this *Review*, Ser. B, ii, p. 199]. They consider that the gecko acts as a reservoir of the oriental sore virus and that *P. minutus africanus*, common at Biskra, carries and inoculates *Leishmania tropica*. Howlett has reported that the Indian *P. minutus* constantly feeds on lizards, especially geckos; and Roubaud confirms this fact with regard to *P. minutus africanus*. Chatton and Blanc found leishmaniform bodies in the blood of eight geckos near Tunis. Lindsay reports that forest workers in Paraguay hold that buba (skin and mucous leishmaniasis) is caused by the bite of IXODIDAE or SIMULIIDAE which have been feeding on the rattle snake.

LAVERAN (A.) & FRANCHINI (G.). **Au sujet d'un Herpetomonas de *Ctenopsylla musculi* et de sa culture.** [On the *Herpetomonas* of *Ctenopsylla musculi* and its cultivation.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 5, 12th May 1915, pp. 266–270.

Wenyon showed that pure cultivations of the *Herpetomonas* of *Pulex irritans* could be obtained and has successfully repeated the process with *Ctenocephalus canis*. The authors made use of *Ctenopsylla musculi*, which differs essentially from *Ceratophyllus fasciatus*, and the *Herpetomonas* found in its digestive tube also differs from *H. pattoni* and possesses such distinctive characters as to justify the erection of a new species. Details of the methods adopted are given and *Herpetomonas ctenopsyllae* is described.

RODHAIN (J.). **Note sur la ponte des Oestrides des genres *Gyrostigma* et *Cobboldia*.** [Note on oviposition by Oestrids of the genera *Gyrostigma* and *Cobboldia*.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 5, 12th May 1915, pp. 275–279.

Sjöstedt in 1910 recognised that the Oestrid fly to which Corti had given the name of *Spathicera* was the adult stage of the large larvae found in the stomach of the rhinoceros and previously named *Gyrostigma* by Brauer. The author has bred a number of flies from *Gyrostigma* larvae taken from *Rhinoceros simus cottoni*, Lyd., on the Welle R. in the north-east of the Belgian Congo, to which district this species of rhinoceros is more or less confined. The Oestrids, bred from pupae, oviposited and it was possible to recognise a number of eggs, collected from the skin of the rhinoceros by the sender, as those of this fly. These were found about the head, at the level of the ears and on the neck and shoulder, and were attached vertically in the creases of the skin in those parts. They were strongly attached and more difficult to remove than the ticks usually found on the rhinoceros. The pupal stage of the three flies bred lasted 36, 37 and 38 days. One female lived about 36 hours and laid 750 eggs on the walls of the cage. The eggs are described and somewhat resemble those of *Gastrophilus equi*. From their position on the animal, it seems probable that they reach their destination by being licked off by a companion, though it is possible that the larvae may find their way into their original host by crawling about. Larvae of the two species of *Cobboldia* inhabiting the African elephant are described. Some examples of one species were reared and the adult insects obtained. Fertilised eggs were always laid on a smooth surface, which led to an examination of the tusks of elephants and the eggs were easily found on the outer surface of the tusk near the lip where the ivory is not continually subjected to friction by the movements of the trunk. Although several flies of the second species were bred out, none of them would oviposit.

NICOLLE (C.). **Le rôle des moustiques dans la transmission du paludisme suspecté en 1774.** [The rôle of mosquitos in the transmission of malarial fever suspected in 1774.]—*Bull. Soc. Path Exot., Paris,* viii, no. 5, 12th May 1915, pp. 279–280.

The following passage is quoted from "Voyage en Dalmatie" by Jean-Baptiste de Fortis, translation published at Berne in 1778, Vol. ii, pp. 216–217, letter iv, addressed to Lord Frederic Harvey, Bishop of Londonderry. "All the inhabitants of this country (the lower part of the Narenta) sleep under tents to protect themselves against mosquitos; delicate persons even pass the day in hot weather under gauze tents. At the time of my visit the number of these annoying insects was so great as to be insupportable. A priest told me that he suspected that the fevers from which the inhabitants of the country suffer severely, arose from the bite of these insects, which after feeding on a rotten carcase or a poisonous plant, settle on men. It is not impossible that miasmata are communicated in this way."

LEGENDRE (J.). **Destruction des poux de corps par le crésyl et le brossage.** [Destruction of body lice by cresyl and brushing.]—*Bull. Soc. Path. Exot., Paris,* viii, no. 5, 12th May 1915, pp. 280–283.

Perhaps the best method of destroying both lice and their eggs in clothing is to subject the garments for twenty minutes to the action of steam under pressure. The whole of the clothing must be treated at the same time, and as complete change is not possible in the field, the process fails in practice even when the somewhat cumbrous apparatus can be set up. The author steeped verminous body linen in solutions of cresyl in water at 10, 5 and 3·3 per cent. for 10 minutes and hung it in the sun. The result was, in all cases, the death of the lice. Further experiment showed that a 2 per cent. solution, freshly prepared, was quite sufficient to kill all lice with which it was in contact for ten minutes. A quart of cresyl in 12½ gallons of water was enough to kill the lice in the body linen of 62 men, each garment being wrung out to recover the liquor as far as possible. Careful and vigorous brushing of uniforms with a hand brush in the open will rid them of both lice and eggs, which fall on the soil and die.

RINGENBACH (J.) & GUYOMARC'H (—). **Notes de Géographie médicale de la Section française de la Mission de délimitation Afrique équatoriale française-Cameroun en 1912-1913.** [Notes on medical geography by the French section of the Franco-Kamerun boundary commission in 1912–1913.]—*Bull. Soc. Path. Exot., Paris,* viii, no. 5, 12th May 1915, pp. 301–313.

The natives of the districts visited were unanimous in declaring that the jigger (*Dermatophilus penetrans*) was introduced into their country by the Senegalese. It is found everywhere, but is strictly seasonal in its habits and attains its maximum numbers in the dry season.

RODHAIN (J.). **Herpetomonas parasites de larves d'Oestrides cavicoles.** [Herpetomonas parasites of intestinal Oestrid larvae.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 6, 9th June 1915, pp. 369–372, 1 pl.

The larvae investigated were found in *Bubalis lelwel jacksoni* and *Potamochaerus porcus* in the North-East of the Belgian Congo, and were those of *Oestrus aureo-argentatus*, Rodh. & Beq., *Oestrus bertrandi*, sp. n., *Gedoelstia paradoxa*, sp. n., *Kirkia ? blanchardi*, Ged., *K. minuta*, sp. n., and *Rhinoestrus nivarleti*, Rodh. & Beq.

SERGENT (E.) & FOLEY (H.). **Destruction par l'essence d'Eucalyptus des poux du corps, agents transmetteurs de la fièvre récurrente et du typhus exanthématique.** [Destruction of body lice, the carriers of recurrent fever and exanthematous typhus, with eucalyptus oil.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 6, 9th June 1915, pp. 378–381.

Experiments are described showing that *Pediculus humanus*, L. (*vestimenti*, De Geer), is killed if placed on material slightly moistened with eucalyptus oil. Of 20 lice placed in a glass vessel with two pieces of twisted cloth, one soaked in the oil and the other clean, 17 took refuge in the latter, while contact with the impregnated material, even in the open air, killed the lice instantly. There is no action in the open air at distances of even less than an inch, but in closed vessels death takes place in a few hours at 4 inches from the saturated rag. A cloth bag containing 200 lice was covered with a square of the same material soaked in the oil and then dried in the air, all the lice being killed in a few hours. The action of the oil is comparable to that of camphorated oil, but more powerful. A piece of cloth soaked in eucalyptus oil and left to dry in the air for four days at 60° F. was thrust into an open tube containing 30 lice, but not in contact with them; all were dead the next day. A dog infested with *Haematopinus piliferus*, Burmeister, was covered with a cloth on which the oil was sprinkled drop by drop; 48 hours later all the lice were dead. Trials of the oil on human clothing showed that 24 hours afterwards all lice had disappeared from the parts actually touched by the oil, and a case is cited of a native of Algiers who was swarming with vermin, but who showed none for several days after treatment. The eggs were apparently not killed, as in eight days young lice made their appearance. Half an ounce of oil is sufficient for about 2 square feet of material, if dropped on one side only; folds and seams should be specially attended to, and it is thought that where change of clothing is impossible, as in the case of soldiers in the field, the regular dressing of the seams with the oil would be practically useful.

LAVERAN (A.). **Leishmaniose américaine de la peau et des muqueuses.** [American leishmaniasis of the skin and mucous membranes.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 6, 9th June 1915, pp. 382–397.

Discussing the probable mode of spread of the American form of leishmaniasis, the author says that biting insects are held responsible for the spread of ulcerative leishmaniasis in America, but it is extremely difficult to obtain evidence of insect bite in a given case. In Panama the natives accuse a fly which they call "mosca boyana," and in Brazil a fly called "cotunga" is the reputed carrier; while at Manaos, A. da Matta believes *Dermacentor electus* to be the agent; Flu, in Surinam, also implicates the Ixodidae. In Paraguay, *Amblyomma striatum*, *A. fossum* and *A. cajennense* have all been regarded as carriers, and the forest workers attribute the disease to the bites of Simuliidae. Brumpt and Pedroso have arrived at the conclusion that Tabanids are far more likely carriers, in that they only attack exposed parts of the body, which agrees with the usual distribution of the ulcers, while the localities in which the disease is most readily contracted are those frequented by these flies. Species of *Stomoxys*, which might be equally incriminated, are far more rare in the forests than in the pastures, in which ulcerative leishmaniasis is never acquired. In Peru, a Simuliid is popularly regarded as the carrier. So many insects have been accused of causing the disease that the evidence at present does not clearly point to any one group of them. Migone has reported that in treating leishmaniasis he has frequently observed that the disease first manifests itself on small abrasions of the skin, and that it is possible that some such break in the surface is necessary for the entrance of the causative organism and that the bite of almost any fly might provide the necessary condition; the author has made a similar observation with regard to Biskra boil. There appears to be no doubt that American leishmaniasis is inoculable and transmissible from man to man, as outbreaks among otherwise healthy forest workers in South America frequently follow on the arrival of an infected subject. Man appears to be the chief reservoir, possibly also dogs. In Paraguay the natives regard the rattle-snake as the natural host of the virus of "buba." When coiled up in the forest it is almost always attended by a cloud of Simuliidae, and numbers of *Amblyomma striatum* are to be found attached to its body; the author does not regard the evidence as in any way scientific, though the gecko is suspected of being a reservoir of the virus of oriental sore. It is possible that, given suitable conditions of environment, the flagellates of insects and Acarids may become pathogenic to man, and the author and Franchini have shown that mammals may be infected with those of fleas and mosquitos, and that their blood will contain organisms bearing a great resemblance to those found in leishmaniasis. These researches require further prosecution, especially as regards the flagellates of Simuliidae and *Phlebotomus*, insects which abound in countries where cutaneous leishmaniasis is endemic.

Migone (L. E.). **Buba, or Leishmaniasis americana, in Paraguay. Further investigations on the Etiology of Leishmaniasis americana.** —*Trans. Soc. Trop. Med. & Hyg., London*, viii, no. 7, June 1915. pp. 219–225 and 226–230.

During recent years a disease called buba has appeared in the north of Paraguay, among the native workmen in the large industrial establishments of these regions, in the Yerba Maté plantations, and in the lumber forests. An ulceration of a chronic character and slow development, attacks the uncovered parts of the body—the feet, legs, arms, neck and face—and later invades the mucous membranes of the nose, pharynx, larynx, palate and lips. This disease has probably spread to this country from the neighbouring state of Brazil, where it has long been known to exist. At the present time, these ulcers are appearing in Paraguay to such an extent that, according to the evidence of patients coming from these districts, hardly a house can be found in which there is not one or more cases of the disease.

The disease has been observed in natives of the country, and in foreign residents, in both sexes and in old persons as well as in infants at the breast. In some districts it has caused terrible havoc. Of one hundred workmen who entered the woods to work, seventy to eighty had to leave within two months owing to the development of ulcers. In Paraguay, as in all other countries where buba exists, the malady has been considered to be identical with syphilis, but of a kind not at all amenable to ordinary specific treatment. Owing to this mistake in diagnosis, the study of the disease was neglected, and its treatment was fruitless, so that it has continued to spread. The disease is known as "buba" in Paraguay, "bouba" in Brazil, "espundia" in Bolivia and Peru, and "ulcera de Torrealba" in Colombia. The symptoms and external appearances are described and it is said that the patient may live 10, 15 or 20 years until the bronchi become involved, when septic fever, malnutrition and exhaustion cause death. Patients constantly attribute the beginning of the trouble to the bite of a tick, but in numbers of cases the ulcer develops round some small excoriation, however caused, and it is easy to find leishmania bodies in the epithelial cells of the pus which exudes from the sore. The author has failed to inoculate the disease and it is almost impossible to find the leishmania bodies in the blood. The second paper is largely a resumé of Brumpt and Pedroso's work [see this *Review*, Ser. B, ii, p. 52] and the author sums up the position as follows: Nothing is known of the etiological phenomena of buba except by assumption from the facts already given. It is therefore necessary to continue the search for the pathogenic agent of buba, and this can only be arrived at by prolonged expert entomological and laboratory investigation on the spot.

ILLINGWORTH (J. F.). **Hen Fleas, *Xestopsylla gallinacea*, Westw.**— *Hawaiian Forester & Agriculturist, Honolulu*, xii, no. 5, May 1915, pp. 130–132.

Echidnophaga (*Xestopsylla*) *gallinacea*, Westw. (fowl flea), does not appear to have been noticed by entomologists in Hawaii prior to 1913, and was probably introduced on poultry from California. While it normally attacks poultry, it appears to infest any other animals that come within range and has been recorded from dogs, cats, horses, rats, owls and man. It is particularly fond of young animals, and hence is sometimes very annoying to children. In East Africa it was found that 22·5 per cent. of the fleas attacking rats belonged to this species, hence they were thought to be an important agent in the distribution of this pest. The author recently discovered that the English sparrows, which swarm in fowl houses, are also infested, and these may act as a rapid agent in carrying it from house to house. It is now pretty generally distributed throughout the world, especially favouring tropical and sub-tropical regions. In the United States it extends as far north as Minnesota. The female fleas remain attached after they have found a suitable host, the eggs being dropped as fast as they are produced. The young hatch in from 3½ to 4 days. The larvae live on dried blood particles in the dust and the excreta of the parents. The length of the larval period varies from 6 to 10 days. A delicate cocoon of the finest silk is spun and the larva then rests, doubled up inside the cocoon, for from 3 to 4 days, after which it enters the pupal stage, lasting from 6 to 9 days. The entire life-cycle takes from 3 to 4 weeks. The author recently discovered that the small brown ants (*Pheidole megacephala*) are important enemies of these fleas and carry off both the eggs and the larvae. These ants also destroy house-fly larvae, as well as many other destructive pests. The water treatment, based on the idea that the larvae cannot exist under moist conditions and used against the larvae of ordinary fleas, has proved most effective against *E. gallinacea.* Within a week of using a hose for washing out a fowl-house every morning, the pest decreased noticeably, and after two weeks, it practically disappeared. Investigation showed that most of the complaints of infestation come from dry districts, wet ones not being troubled. A 5 per cent. solution of creolin may be used for spraying the houses, bedding, etc., of domestic animals, such as dogs and cats. This treatment may also be useful in dwellings where a free use of water is not practicable. For the treatment of the animals themselves, weaker solutions should be used, as follows :—For dogs, 3 per cent.—about 5 teaspoonsful to a quart of water. Cats, fowls, etc., 2 per cent.—about 3 teaspoonsful to a quart of water.

SKINNER (H.). **How Does the House-fly Pass the Winter? (Dipt.)**—*Entom. News, Philadelphia,* xxvi, no. 6, June 1915, pp. 263–264.

The report by Copeman and Austen [see this *Review*, Ser. iii, p. 88] is summarised and further evidence is adduced that *Musca domestica* hibernates in the pupal stage, freshly emerged flies having been taken in the Entomological Department of the Academy of Natural Sciences of Philadelphia on 15th, 17th and 23rd February 1915. No hibernated specimens were seen and a freshly emerged male was taken, and it is regarded as a fact that house-flies of both sexes emerge from pupae in the late winter or early spring and that these flies are capable of producing the large summer broods.

MOTE (D. C.). **Some Important Animal Parasites affecting Ohio Live-Stock.**—*Ohio Agric. Expt. Sta., Wooster.* Bull. no. 280. December 1914, pp. 23–52, 17 figs. [Received 22nd June 1915.]

The following is a preliminary list of insect parasites of live-stock in Ohio :—*Gastrophilus intestinalis* (bot fly) and *Trichodectes parumpilosus,* attacking horses ; *Hypoderma lineatum* (warble fly), *Trichodectes scalaris* and *Haematopinus eurysternus*, on cattle ; *Oestrus ovis* (nostril fly) and *Melophagus ovinus* (sheep tick), on sheep ; *Haematopinus suis* on pigs ; *Menopon biseriatum* on fowls. Four species of bot fly are found in the United States, viz., *Gastrophilus intestinalis, G. haemorrhoidalis, G. nasalis* and *G. pecorum* ; *G. intestinalis* is the commonest and in Ohio has been found in five widely separated counties. The eggs are laid on the hairs of the shoulders, legs, and ventral side of the body during the summer and early autumn. Moisture and friction seem necessary to hatch the eggs. The larva is transferred to the mouth by means of the tongue or lips; thence it passes to the stomach, where it becomes attached by means of two hooks. Maturity is reached in the following spring; the larva passes out of the rectum and into the ground to pupate. The adult emerges after 30 or 40 days. The attachment of the larvae to the wall of the stomach interferes with glandular action; inflammation and irritation of the rectum may follow attachment in this region. *Hypoderma lineatum* causes serious loss to cattle-owners. The skin becomes perforated by the outward passage of the larvae from the muscles of the back for pupation, and thus lowers the value of the hides. *Psoroptes communis* var. *ovis* causes scabies in sheep, and may result in the death of from 10 to 80 per cent. of the flock. Quarantine regulations and steps taken to eradicate the disease in the quarantined areas are doing much to stamp out this pest. Care of the pastures is important in the control of parasites. If internal parasites are prevalent, it is not advisable to top dress pastures with manure from infected animals. A rotation of pastures will facilitate control. The carcases of animals dying on the farm should be burned or deeply buried, and a strong disinfectant scattered over the surface of the ground with which the animal has come in contact.

DRAKE-BROCKMAN (R. E.). **On an epidemic of African Tick Fever among the Troops in British Somaliland.**—*Trans. Soc. Trop. Med. & Hyg., London,* viii, no. 7, June 1915, pp. 201–211.

Though *Ornithodorus savignyi* has been known to the Somalis for years, tick fever is of recent appearance in the country and was first recognised at Bulhar in 1912, whence it spread to Hargeisa [see this *Review*, Ser. B, iii, p. 72]. In 1914, it was necessary to send a company of Somaliland Camel Constabulary to the latter place, and a large number of the men contracted the disease. They admitted being bitten by the tick, locally known as "Kudkuda," and quantities were found in the soil among the huts and in places where the natives congregated. The tick can be found almost anywhere in the country where the soil is light, powdery and dirty, and the place freely frequented by man and animals. It has no special predilection for the blood of man, but will feed on camels, horses, mules, donkeys, sheep, and goats. It moves rapidly over the surface of the soil and a person standing on an infested spot will find them swarming over his boots, and cattle are often so worried by them that they will leave shade even in the hottest hours of the day, the ground under shade trees being specially infested. The human subject is generally attacked at night, the native habit of sleeping on the ground affording a good opportunity to the ticks. They are tenacious of life and will live for months without food, provided they can burrow in the soil, just below the surface, so as to be able to emerge quickly when disturbed; they will live in a well-corked bottle for months, and though apparently dead, revive quickly on exposure to air. Avoidance of infested places is a simple remedy against attack, and filth and rubbish which afford suitable feeding places should be cleared away. A soft tick is killed in a half a minute if touched with a small drop of turpentine, and if the skin be rubbed with turpentine the ticks will rarely bite; when conveying patients from one locality to another, this treatment is recommended to prevent spread of the disease. Infested spots are best dealt with by lighting a circle of fire round the outer edge, and so feeding the fire from the inside that the whole area is burned over; this is specially applicable to the neighbourhood of wells. Soaking the soil with corrosive sublimate (1 : 1,000) is of no avail, and experiments show that the ticks will stand even prolonged immersion in sand thoroughly wetted with the solution without suffering the least harm. In the discussion which followed, Dr. Baker said that four companies of the King's African Rifles went from Uganda to Somaliland in 1910, and possibly took spirochaetes with them. Dr. Low said that *O. moubata*, in Uganda, lives in cracks in the floor and walls of houses and huts, and never in great numbers on the sandy soil of camping grounds; it resembles a bug in its habits, biting at night and retiring by day; the bites are painful, and there is often considerable inflammation. Dr. Sandwith remarked that in dealing with plague in Egypt, gallons of corrosive sublimate were used against fleas without the slightest effect. The author stated that missionaries are constantly attacked by tick fever, as the rest houses kept for Europeans are inhabited by natives in their absence and become badly infested. Dr. Baker said that his practice, when in charge of troops or police, was to have all the native shelters burned on breaking camp; labour camps at stations require the same treatment, and if the money be available, it would be better to have permanent buildings for labourers.

The "mosquero" or spiders' nest used in Mexico as a fly-trap.—*Bull. Soc. Nat, Acclimat., Paris,* **lxii, no. 6, June 1915, pp. 170–171.**

According to M. Diguet, it has been hitherto impossible to preserve in Europe the spiders' nest known in Mexico as "mosquero" and used there as a fly-trap. In Mexico, the three necessary conditions are shade, a high degree of humidity and a living tree. The first two are obtainable by hanging a nest, or a portion of one (a nest may amount to 40 cubic feet in bulk), in a room where water is evaporated. The spider itself only measures about $\frac{1}{12}$ inch and has a larger spider as a commensal. Very often other insects are found in the nest, especially some small Coleoptera, which doubtless keep the nest in a clean state by eating the bodies of the flies from which the small spiders have sucked the juices. The structure of the nest resembles that of a sponge.

SOULIMA (A.) & EBERT (B.). **Nouveaux remèdes contre les Ectoparasites.** [New remedies against ectoparasites.]—*C. R. Soc., Biol., Paris,* **lxxviii, no. 14, 25th June 1915, p. 340.**

After examining a large number of known remedies, which were all re-prepared and tested, the following are considered to be the most efficient and the best adapted to the circumstances of armies in the field:—(*a*) 35 per cent. cresol and 65 per cent. naphtha soap; (*b*), 35 per cent. xylol and 65 per cent. naphtha soap; (*c*) 5 per cent.

turpentine, 5 per cent. petrol, 2 per cent. oil of cinnamon and 88 per cent. talc. The first named is specially useful, as it not only kills the lice and their eggs rapidly, but the odour, which is retained for a long time by the clothing, will keep the lice away for several weeks. A 10 per cent. solution in water is recommended, body linen to be soaked in it and all outer clothing well wetted and the mixture rubbed in with a brush.

De Stefani (T.). **Note di Myiasis negli animali e nell' uomo.** [Note on Myiasis in animals and man.]—*Il Rinnovamento Economico-Agrario, Trapani*, ix, nos. 5 & 6, May-June 1915, pp. 89–92 & 110–113.

A general account is given of *Hypoderma bovis* and *Gastrophilus equi*, and 100 larvae of the latter on 6 square inches of gastric mucous membrane is stated to be a not uncommon degree of infestation. Two cases of myiasis are cited in children, one in which the nasal cavities were blocked by a large larva of *Oestrus* (*Cephalomyia*) *ovis*, and another of invasion of the conjunctiva by the same larvae. The following Diptera are said to be very commonly the cause of myiasis in one form or another in Sicily:—*Chrysops caecutiens*, L., attacks the eyes of cattle and is a common cause of conjunctivitis. *C. marmoratus*, Rossi, *C. perspicillaris*, S., and *C. connexus*, Lw., are also Sicilian species. Cases of intestinal myiasis in man caused by the Syrphid, *Eristalis arbustorum*, L., and *Pollenia rudis*, F., are noted. *Sarcophaga carnaria*, L., is very common in Sicily and cases of myiasis caused by its larvae are not uncommon. *S. latifrons*, Fll., *Calliphora vomitoria*, L., *C. azurea*, Fll., and *C. erythrocephala*, Mg., *Lucilia caesar*, L., and *L. sericata*, Mg., also cause myiasis, and it is stated that the larvae of *Fannia canicularis*, L., are frequently swallowed with green food and cause serious gastric disorders. Larvae of *Anthomyia pluvialis*, L., have been found in the auditory canal in man. *Piophila casei*, L., can hardly be considered as causing myiasis, because the larvae are often deliberately swallowed, though they have been known to pupate in the human intestine and to develop into adults causing intense colic. The author concludes with general advice as to the avoidance of risks and care and attention to domestic animals, so that, if attacked, they may be relieved as soon as possible.

Scott (H. H.). **An Investigation into the Causes of the Prevalence of Enteric Fever in Kingston, Jamaica; with special reference to the question of unrecognised carriers.**—*Ann. Trop. Med. & Parasit., Liverpool*, ix, no. 2, 30th June 1915, pp. 239–284, 10 charts.

Flies are very numerous at most seasons of the year in the poorer parts of the city in which many of the cases of enteric fever originate, but especially during the "mango season," which begins about May, and at this time the number of cases begins to increase. Cockroaches are also very troublesome.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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PRIESTLEY (H.). *Theileria tachyglossi* **(n. sp.). A Blood Parasite of** *Tachyglossus aculeatus.—Ann. Trop. Med. Parasit., Liverpool,* **ix, no. 2, June 30th 1915, pp. 233–238, 1 plate.**

No blood parasites of Monotremes have hitherto been described, but the author has discovered in Australia in the blood of an Echidna, *Tachyglossus aculeatus,* numerous bodies in the red corpuscles resembling *Theileria parva* in form and life-history, which he describes as *T. tachgylossi,* sp. n. The animal was apparently healthy, but was infested by ticks, *Aponomma decorosum,* L. Koch.

BREINL (A.). **On the Occurrence and Prevalence of Diseases in British New Guinea.**—*Ann. Trop. Med. & Parasit, Liverpool,* **ix, no. 2, 30th June 1915, pp. 285–334, 6 plates, 1 map.**

This paper embodies the scientific results of two journeys to the coastal belt of British New Guinea, which were undertaken for the purpose of mapping out the incidence and geographical distribution of tropical diseases among the natives. The first journey took place during the months of July and August, 1912, and included the coastal belt east of Port Moresby and north of Samarai, as far as the Mambare River. During the second journey, lasting from the end of June to the beginning of October 1913, the coastal regions west of Port Moresby as far as Daru were visited. To the Purari River the journey was accomplished on foot, and continued from there in native canoes. The coast of New Guinea east of Port Moresby is fairly densely populated, the natives living in numerous villages ranging in size from three or four houses to large settlements with approximately 3,000 inhabitants, although very large villages are rare. The general character of the villages and their surroundings are described, and it is remarked that inter-village trade and the employment of natives not hitherto accustomed to travel far from their homes afford facilities for the spread of disease. Malaria in early childhood is common, even infants in arms suffering from the disease. The distribution of malaria is shown on a map of S.E. New Guinea and the relative numbers of children with normal and enlarged spleens and the prevalence of malignant tertian, simple tertian and quartan fever are indicated. White settlers are said rarely to escape malarial fever during their stay in the country. *Anopheles* (*Nyssorhynchus*) *annulipes* and *A. punctulatus* are common in the ratio of about 10 of the former to 1 of the latter, and the relation of the former to the prevalence of the disease would seem to point to it as the common carrier; *A. bancrofti* was also found, but is not a carrier. Only one specimen of *Stegomyia pseudoscutellaris* was captured in Samarai on the S.E. Coast and it was found nowhere else. The following list of Papuan mosquitos, chiefly collected by Dr. Giblin and the author on the Lakekamu goldfield, is given :—*Anopheles* (*Myzorhynchus*) *barbirostris,* var. *bancrofti,* Giles, *A.* (*Nyssorhynchus*) *annulipes,* Walk., *A. punctulata,* Theo., *Armigeres obturbans,* Walk., *Neosquamomyia breinli,* Taylor, *Stegomyia fasciata,* F., *S. scutellaris,* Walk., *S. pseudoscutellaris,* Theo., *S. ornata,* Taylor, *S. atra,* Taylor, *Ochlerotatus* (*Scutomyia*) *notoscripta,* Skuse, *Lepidotomyia lineatus,* Taylor, *Leucomyia australiensis* var. *papuensis,* Taylor, *L. albitarsis,* Taylor, *Ochlerotatus* (*Culicelsa*) *vigilax,* Skuse, *Culex sitiens*, var. *milni*, Taylor, *C. fatigans*, Wied., *Taeniorhynchus* (*Pseudotaeniorhynchus*) *conopas*, var. *giblini*, Taylor, *T.* (*Chrysoconops*) *brevicellulus*, Theo., *Mansonioides* (*Taeniorhynchus*) *septempunctata*, Theo., *M.* (*Taeniorhynchus*) *uniformis*, Theo., *Taeniorhynchus papuensis*, Taylor, *Melanoconion papuensis*, Taylor, *Finlaya poicilia*, Theo., *Uranotaenia nigerrima*, Taylor, *Hodgesia triangulata*, Taylor.

FANTHAM (H. B.). **Insect Flagellates and the Evolution of Disease, with Remarks on the Importance of Comparative Methods in the Study of Protozoology.**—*Ann. Trop. Med. & Parasit., Liverpool*, ix, no. 2, 30th June 1915, pp. 335–348.

The author discusses the significance of the herpetomonad stage of leishmania, the existence of the herpetomonad stage of leishmania and allied parasites in man and the occurrence of herpetomonads in plants. As a result of experiments by Laveran and Franchini and by Fantham and Porter, it is now known that a number of species of *Herpetomonas* and *Crithidia*, naturally occurring in insects, may be successfully inoculated into or fed to mammals, especially rats and mice, and may become pathogenic to the mammal, whereas they are natural or specific parasites of the host, in which the effects are not marked, passing through a pre-flagellate, a flagellate, resistant post-flagellate, and a leishmaniform stage adapted for extra-corporeal life and for transmission to a new host. Fantham and Porter further showed that flagellates occurring in insects unassociated with the experimental vertebrate may be introduced into it [see this *Review*, Ser. B, iii, pp. 68–69], and in a later paper the researches were extended to cold-blooded vertebrates. The author infers from the results obtained that in them we see leishmaniasis in the making, and that probably only one species of *Herpetomonas* is concerned in adapting itself to life in vertebrates in different parts of the world. This species is known under various names, such as *H. pattoni*, *H. ctenocephali*, *H. pediculi*, *H. donovani*, *H. infantum*, *H. tropica*. These are probably merely physiological races of a herpetomonad which is very like *H. jaculum*, briefly described by Leger in 1902 from the gut of the Hemipteron, *Nepa cinerea*. This herpetomonad under different conditions of environment produces pathogenic effects in very varying degrees in different vertebrates, from zero as in Dutton and Todd's mice, to high mortality as in Indian kala-azar, and probably zero again in cold-blooded hosts. It is also a flagellate which can probably live in invertebrates not already recorded as being infected. The work of Price and Rogers in the tea gardens of Assam, i.e., segregation without waiting for the determination of the precise insect carriers of kala-azar, is warmly commended [see this *Review*, Ser. B, ii, 67].

WEISS (H. B.). **Preliminary List of New Jersey Acarina.**—*Entom. News, Philadelphia*, xxvi, no. 4, April 1915, pp. 149–152.

The following species of ticks and mites attacking man and other animals, are recorded:—*Ixodes cookei*, Pack., on small mammals; *Haemaphysalis chordeilis*, Pack. (bird tick); *H. leporis-palustris*, Pack., on rabbits; *Amblyomma americanum*, L. (lone star tick), on a wide range of hosts; *Dermacentor variabilis*, Say (dog or wood tick); *Dermanyssus gallinae*, Redi (chicken mite); *Celaenopsis latus*, Bks.; *Laelaps multispinosus*, Bks., on musk-rat; *Pediculoides ventricosus*, Newp., causing a skin eruption in man: *Cnemidocoptes gallinae*, Railliet, on chickens, burrowing near the base of the feathers; *C. mutans*, Robin (itch mite), attacking legs, comb and neck of chickens, and causing " scaly leg."

de Meijere (J. C. H.). **Diptera aus Nord-Neu-Guinea.** [Diptera from northern New Guinea.] *Tijdschrift v. Entomologie d. Nederl. Entom. Ver., s'Gravenhage*, lviii, 1–2, 15th March 1915, pp. 98–139, 1 plate. [Received 8th July 1915.]

The Diptera from northern New Guinea recorded and described in this paper include a Hippoboscid, *Ornithoctona nigricans*, Leach, and the Tabanids, *Tabanus basifasciatus*, sp. n., *T. ceylonicus*, Schiner, *T. insurgens*, Walk., *T. albithorax*, Ric., *T. breviusculus*, Walk., and *T. cohaerens*, Walk.

Winn (A. F.) & Beaulieu (G.). **A Preliminary List of the Insects of the Province of Quebec. Part ii—Diptera.**—*7th Rept. Quebec Soc. for the Protection of Plants, Quebec*, 1st May 1915, pp. 108–159.

This list includes the following biting and other flies:—

Culicidae: *Anopheles punctipennis*, Say, *Aedes canadensis*, Theo., *A. cantans*, Meig., *A. cinereoborealis*, Felt, *A. consobrinus*, Rob.-Desv., *A. dyari*, Coq., *A. pagetonotum*, D. & K., *A. pullatus*, Coq., *A. subcantans*, Felt, *A. sylvestris*, Theo., *Culex pipiens*, L.

Simuliidae: *Simulium hirtipes*, Fries; *S. invenustum*, Walk., *S. molestum*, Walk., *S. pictipes*, Hagen.

Tabanidae: *Pangonia tranquilla*, O. S., *Chrysops aestuans*, Wulp, *C. callidus*, O. S., *C. carbonarius*, Walk., *C. celer*, O. S., *C. cuclux*, Whitney, *C. excitans*, Walk., *C. frigidus*, O. S., *C. fugax*, O.S., *C. indus*, O. S., *C. mitis*, O. S., *C. niger*, Macq., *C. obsoletus*, Wied., *C. sackeni*, Hine, *C. vittatus*, Wied., *Tabanus affinis*, Kirby, *T. astutus*, O. S., *T. bicolor*, F., *T. epistates*, O. S., *T. lasiopthalmus*, Macq., *T. lineola*, F., *T. nigrovittatus*, Macq., *T. orion*, O. S., *T. recedens*, Walk., *T. reinwardtii*, Wied., *T. septentrionalis*, Lw., *T. trispilus*, Wied., and *T. zonalis*, Kirby.

Oestridae: *Gastrophilus equi*, F., and *Hypoderma bovis*, De Geer.

Muscidae: *Pollenia rudis*, F., *Chrysomyia macellaria*, F., *Cynomyia cadaverina*, R.D., *Calliphora erythrocephala*, Meig., *C. vomitoria*, L., *Lucilia caesar*, L., *Phormia regina*, Meig., *P. terrae-novae*, R.D., *Pyrellia serena*, Meig., *Morellia micans*, Macq., *Musca domestica*, L., *Graphomyia maculata*, Scop., *Stomoxys calcitrans*, L., *Lyperosia* (*Haematobia*) *irritans*, L., *Muscina assimilis*, Fall., *M. stabulans*, Fall., *Myospila meditabunda*, F., *Pseudopyrellia* (*Orthellia*) *cornicina*, F.

Hippoboscidae: *Pseudolfersia maculata*, Coq., and *Melophagus ovinus*, L.

KINLOCH (J. P.). **An Investigation of the Best Methods of Destroying Lice and other Body Vermin.**—*Brit. Med. Jl., London,* no. 2842, June 1915, pp. 1040–1041.

As the result of a very large number of experiments, the author concludes that dry heat is more effective than moist heat in destroying lice and their eggs. Though lice can be revived after immersion for one minute in water at 100° C., exposure to a dry heat at the same temperature and for the same time, appears to kill both adults and eggs. The paraffin bodies are actively insecticidal, and of these, petrol is the most effective. Lice and their eggs are destroyed by immersion in petrol for one minute, and they may be killed by exposure to the vapour of petrol for half an hour. Powerful fatty solvents other than the paraffins, are also actively insecticidal. Benzene, toluene, and acetone are as toxic to lice as petrol. Certain chlorine derivatives of methane, ethane and ethylene are more lethal to lice than any other substances, and have the important merit of being non-inflammable. Immersion in the chlorine derivatives of ethane and ethylene immediately destroys all lice and their eggs, while exposure to the vapour of these substances for five minutes is equally destructive to them. Even soap solutions containing 2 per cent. of trichlorethylene or 10 per cent. of tetrachlorethane are capable of killing both adults and eggs in half an hour at ordinary temperatures. A 25 per cent. solution of dichlorethylene or trichlorethylene in vaseline when applied to the human body has been found capable of exerting its insecticidal action for hours. The action of a 25 per cent. solution of petrol in vaseline is of shorter duration, but is also effective for some hours. The common phenol disinfectants in their usual degrees of dilution for disinfectant purposes and at ordinary temperature fail to kill lice or their eggs, even after steeping for half an hour, but become efficient as insecticides if the temperature of the steeping tank is maintained at 65° C. The volatile oils have no direct insecticidal effect. In a moist vapour of oil of wintergreen, oil of cloves, oil of caraway, oil of turpentine, oil of eucalyptus, oil of thyme, etc., lice live for many hours at body temperature, and can be revived after immersion in these oils. When in contact with solid substances, such as iodoform, camphor and paraform, or in contact with garments impregnated with sulphur, borax, black hellebore, alum, etc., lice appear to remain practically unaffected. Lice, when hungry, feed on the human body even if previously anointed with sulphur ointment, balsam of Peru, mercury oleate ointment, chrysarobin ointment, stavesacre ointment, and hellebore ointment. It still however remains to be determined whether some of these bodies which have been shown not to be actively insecticidal, may not have, when rubbed on the body or placed in the clothing, a useful repellent effect on the body vermin. For practical purposes it has been found that destruction of lice and their eggs is best secured by immersion of verminous garments and bedclothes in a petrol or benzene bath. Danger from fire and waste of petrol are avoided by using such a bath and extractor as are employed in a dry-cleaning apparatus. In such an apparatus, 90 per cent. of the petrol or benzene is recovered for future use. A petrol or benzene bath is necessary, especially for uniforms and woollen garments generally. Where the clothing is such that it is not injured by immersion in water, steeping the garments for half an hour at 12° C. (54° F.) in a soap solution containing 2 per cent. of trichlorethylene or 10 per cent. of tetrachlorethane is effective. Steeping for half an hour in a 5 per cent. solution of cyllin in water maintained at 65° C. (149° F.) is also effective on woollen articles. For reasons of economy, the chlorine derivatives of ethane and ethylene cannot be used at present in a dry-cleaning process, but their soap preparations are of value. Petrol has a wide application and is readily obtained. For cleansing the body itself, bathing or sponging with soap solutions containing 2 per cent. of trichlorethylene or 10 per cent. tetrachlorethane gives the best results. In view of the known insecticidal action of these chlorine derivatives of ethylene and ethane, it is probable that good results would be obtained by shampooing verminous heads with their soap preparations and it is also probable that a 25 per cent. solution of trichlorethylene in vaseline would form an efficient insecticidal ointment. It is almost certain that lice would not continue to live on the human body if anointed daily with a 25 per cent. solution of trichlorethylene in vaseline or on the body anointed twice daily with a solution of petrol in vaseline of similar strength. The odour of such an ointment is not unpleasant, but when living under verminous conditions, constant precautions would have to be taken and every method of destroying vermin would require to be employed. Any attempt to render an army free from vermin in war time would require that all men occupying the same quarters at the same time, or for alternating short periods of time, should be regarded as a single unit for which a receiving station with cleansing apparatus should be provided. Such an attempt would also require that the movements of the men off duty were controlled, and this would be limited by military necessities.

BODKIN (G. E.). **Report of the Economic Biologist.**—*Rept. Dept. Science and Agric., British Guiana, 1913–1914, Georgetown*, 30th April 1914, 11 pp. [Received 24th July 1915.]

During the year mal de caderas appeared among mules on a number of sugar plantations, resulting in a heavy mortality. As the disease is popularly supposed to be insect-transmitted, investigations were made in the infected areas. Instructions were given as to the preparation of a suitable fly repellent with which animals on infected plantations were to be dressed. Several species may be responsible for the spread of the disease, assuming it to be thus transmitted. These, in order of prevalence, were: *Stomoxys calcitrans*, L., *Tabanus trilineatus*, Latr., *T. semisordidus*, Walk., *T. impressus*, Wied., *T. desertus*, Walk., *T. caiennensis*, F., *Chrysops tristis*, F., and *C. costata*, F.

Report of the Veterinary Committee.—*Rept. Dept. Science and Agric., British Guiana, 1913–1914, Georgetown*, 30th April 1914, pp. 11–14. [Received 24th July 1915.]

Mal de caderas is prevalent in the counties of Demerara and Berbice, and quarantine restrictions have been placed on infected districts. The precautions recommended include isolation of infected animals; cleaning stables with kerosene or chloro-naphtholeum and subsequent lime-washing, the wash containing 5 per cent. crude carbolic acid or other strong smelling antiseptic substance; burning off pastures where infected animals have grazed; the protection of animals from bites of flies by means of a suitable wash, the use of which is specially recommended before crossing pastures where infected animals have been. Such an insecticide may be prepared as follows: Soft soap, ½ lb., water, ½ gal., kerosene, 2 gals., fish oil, ½ gal.; the mixture is diluted 8 times before use. In view of the fatal nature of the disease, affected animals should be destroyed and the carcases burned.

HERRICK (G. W.) **Poultry Parasites: Some of the External Parasites that infest Domestic Fowls, with Suggestions for their Control.**—*Cornell Univ. Agric. Expt. Sta., Ithaca, N.Y.*, Circular no. 29, May 1915, 11 pp., 5 figs.

The parasites of fowls described in this paper are placed in order of importance and include *Menopon pallidum*, Nitzsch (common fowl) louse), *Menopon biseriatum*, Piaget (common large louse of the fowl), *Dermanyssus gallinae*, De Geer (poultry mite), and *Ceratophyllus gallinae*, Schrank (the common fowl flea). Lice, chicken mites and hen fleas all respond to much the same treatment, though the lice may require additional and special measures. The most potent cause of the presence and increase of these parasites is dirt, lack of light being also a very important factor. The poultry house should be high enough and roomy enough for a man to stand and walk about in it with some degree of comfort and, if possible, all the fittings should be removable. To disinfect a house, three careful applications of a kerosene or crude petroleum spray are necessary with a week's interval between each. An efficient emulsion may be made by shaving half a pound of laundry or whale-oil soap and dissolving this in one gallon of nearly boiling water; 2 gals. of kerosene oil are added and the mixture is agitated until a white, creamy emulsion is formed. To make a ten per cent. emulsion, 17 gals. of water is added to the 3 gals. of stock mixture; the addition of only 10⅓ gals. of water results in a fifteen per cent. emulsion. Spraying should be followed by a dusting of dry, air-slaked lime. Horses are liable to attack by the poultry mite and the poultry house should be at some distance from other farm buildings, especially from horse or cow stables. Sitting hens should be isolated, as mites are likely to infest them and increase enormously in their nests. The provision of a dust bath in the poultry house is of great benefit. Small quantities of snuff, sulphur, or dry, slaked lime, or all three of these may be added to it. These measures are more especially applicable to the poultry mite, although most of them are of value against fowl lice also, although these are permanent parasites and rarely leave their hosts. The following remedy against them is effective. Two and one-half pounds of plaster of Paris is spread in a shallow pan or tray; one-fourth pint of crude carbolic acid is mixed with three-fourths pint of gasoline. This mixture is poured over the plaster of Paris and thoroughly mixed. It is then rubbed through a wire window screen on to a piece of paper and allowed to stand for from 1½ to 2 hours or until thoroughly dry. It must not be placed near a flame or any heat. In a closed container this powder will retain its strength for a long time and a small pinch especially about the vent and under the wings. The average cost of dusting with this mixture is about 1s. 4d. per 100 fowls. The dipping of fowls is not advised, as the effect on the birds is rather severe. The following dips have however been used: Pure carbolic acid, 1¼ oz., in 1 gal. of hot water. When the solution has cooled, the fowl should be dipped in it for 1 minute only. Creolin at the rate of 2½ oz. to a gallon of water may be used instead of carbolic acid. A very convenient mixture for painting perches, fittings, walls, etc., of a poultry house, is a combination of 3 parts kerosene and 1 part of crude carbolic acid. Another mixture is known as cresol soap. This is made by shaving a 6d. cake of laundry soap into one pint of soft water. When a soap paste is formed, one pound of commercial cresol is added and the mixture allowed to stand until the paste is dissolved. One gallon of kerosene is then stirred in. This mixture should be applied undiluted, care being taken that it does not touch the hands or face of the manipulator.

Bishopp (F. C.). **Flies which cause Myiasis in Man and Animals—Some Aspects of the Problem.**—*Jl. Econ. Entom., Concord*, viii, no. 3, June 1915, pp. 317–329.

Oestrus avis (sheep bot) is primarily a pest of sheep, but sometimes attacks other animals and man. In certain elevated regions of the Sahara, the eggs or larvae are deposited upon the conjunctival and nasal mucous membranes of man and cause much trouble from March to June. The fly is common in many parts of the United States, but there is as yet no record of myiasis in man being caused by it. Cases of man being infested by larvae of *Hypoderma lineata* (ox warble) are known. In some instances the larvae move beneath the skin until mature, in others, they develop at the root of the tongue or within the orbit of the eye. *Dermatobia hominis* is a common cause of dermal myiasis in man and animals in tropical America. *Chrysomyia macellaria* is troublesome in Mexico, the West Indies, Central and South America, *Lucilia sericata, L. cæsar, Phormia regina* and *Sarcophaga* spp. being next in importance. *Sarcophaga pyophila* in South America and *S. lambens* in Brazil are known to cause human myiasis. In Hawaii, *Pycnosoma* (*Calliphora*) *dux* causes serious loss among sheep by attacking scars caused by sheep scab and by blowing soiled wool, from which the larvae ultimately work into the flesh. In Australia, *Anastellorhina augur*, F. (*Calliphora oceaniae*), *Pollenia stygia*, F. (*C. villosa*), and *Pycnosoma* (*C.*) *rufifacies* are responsible for the infestation of sheep. *Lucilia sericata* and *L. cæsar* occur commonly in Australia. In Great Britain and parts of Europe the two last-named species cause the blowing of wool. In southern Russia, *Wohlfahrtia magnifica* is connected with similar injury in sheep; this species is viviparous and infests 25 per cent. or more of the sheep annually. *Sarcophaga ruficornis* produces severe forms of myiasis in India. Apart from the causation of myiasis, Muscids and Sarcophagids are important in that they all have the habit of visiting carcases and other decaying animal and vegetable matter. In the south of the United States, these flies are a pest in the vicinity of slaughter-houses. Eggs may be deposited on the carcases and the larvae may penetrate the flesh unless strict vigilance be exercised. Access to foodstuffs by the flies is dangerous, owing to the fact that various bacteria can pass through the alimentary tract of the insects without destruction and can thus be deposited on the food. Cases of intestinal myiasis by flies of this group are rare, but cases in man of nasal or auricular myiasis have been recorded.

C. macellaria causes considerable losses on ranches in west Texas, New Mexico and Arizona. Injury to sheep in west Texas is caused by species of *Lucilia*, and during the winter, infestation by *Phormia regina* of wounds resulting from dehorning, castration and branding, may occur. Investigations indicate that all cases of myiasis in animals during summer and autumn are due to *C. macellaria*, which has the effect of causing owners to reduce the size of their herds, especially during the fly season. The screw worm has developed a tendency to attack living animals and, when flies are numerous, the slightest wound becomes a site for entrance. Live-stock are therefore not branded after 1st May or before 1st November, while dehorning, etc., is performed during the winter months. Any animal giving birth to young during the summer is likely to become infested, and calves are often injured in the mouth, causing the loss of teeth. Infestation in pigs occurs in the ears as the result of wounds caused in fighting. Infestation of sheep, goats and dogs may occur on any part of the body. A frequent source of infestation results from the presence of ticks; live-stock attacked by horn flies, stable flies or Tabanids invariably develop cases of screw-worm.

The question of the relationship of meat-infesting flies to disease transmission is deserving of more extended investigation. Some connection exists between carcase-infesting flies and the so-called limberneck in fowls. The latter have been observed to become partially paralysed and die from eating maggots and decaying animal matter. Dr. E. W. Saunders, of St. Louis, believes that there is some connection between limberneck in fowls and poliomyelitis in man, and that certain species of blow-flies are responsible for the transmission of the disease. Observations on the habits of meat-infesting flies, particularly *C. macellaria*, suggest the possibility of a connection between the flies and the transmission of anthrax among live-stock in Texas. Infection may be produced by bacilli carried on the legs and body or by regurgitation of the germ-laden food or possibly by excrement.

The paper concludes with a summary of the life-history and seasonal prevalence of some of the species of flies which cause external myiasis in the United States. The method of wintering of *C. macellaria* has not been definitely determined. Experiments in keeping adult and immature stages through the winter proved unsuccessful. Certain facts indicate that the species normally dies out in the winter, except possibly in the extreme southern parts and in the tropics, and re-infestation of the country progresses as the season advances. The first infestations of live-stock are found in May; September and October are usually the months of greatest injury. A partial checking of the ravages of the species may occur in the hot and dry midsummer. In western Texas, years with abnormally heavy rainfall are generally most productive of infestation. The period from emergence of adults to deposition of eggs ranges from 3 to 18 days. Under the most favourable conditions, the depositions may occur at intervals of two to four days. The number of eggs deposited varies from 40 to 248. The larvae hatch in a few hours; pupation takes place from 6 to 20 days later, and the pupal period ranges from 3 to 27 days. From 10 to 14 broods are produced during the summer in southern Texas. *C. macellaria* shows a marked tendency to breed in animals which have recently died rather than in old carcases. The deposition of living young has not been observed in Texas. This species occurs in great numbers in places remote from any habitation.

Lucilia sericata passes the winter in the larval and pupal stages and breeds in early spring in decaying animal matter. In summer, oviposition occurs within from 5 to 9 days after the adults emerge from the puparia. Incubation varies from 1 to 7 days, according to the temperature. Pupae are formed in from 3 to 9 days after hatching and adults emerge within 3 to 13 days after pupation.

L. caesar winters in the larval and pupal stages, the adults appearing in early spring or during warm periods in mid-winter. The pre-oviposition period lasts from 6 to 20 days. The eggs hatch in less than 24 hours, and pupae are formed in from 3 to 12 days. The pupal period ranges from 5 to 16 days. Low temperatures may lengthen the prepupal stages for several weeks.

Phormia regina is commonly seen in houses during late autumn and early spring. In the Southern States this fly practically disappears during hot weather. It is largely a carrion feeder. Oviposition begins in 7 to 18 days after emergence. The egg-stage lasts from 1 to 4 days, and the pupal from 3 to 13 days. *Calliphora erythrocephala* is found in Eastern Texas. The deposition of eggs begins in 12 to 17 days after emergence. The incubation period is 24 hours and the larvae begin to migrate from the food 3 or 4 days after hatching. The pupal stage lasts from 7 to 9 days. *Cynomyia cadaverina* appears together with *P. regina* in autumn. Food products of animal origin serve as breeding places. The first eggs are deposited from 7 to 20 days after emergence, these hatch in 1 or 2 days, while puparia are formed in 5 to 39 days later. The duration of the pupal stage is from 6 to 58 days.

The adoption of remedial measures based on the prevention of breeding in decaying animal matter is difficult, owing to the fact that carrion-breeding flies are regarded as beneficial scavengers. The appearance of anthrax has compelled the destruction of animals dying from this disease; destruction by burning has had a salutory effect on the number of screw-worms in some districts. Where *C. macellaria* and other flies are prevented from increasing in large numbers, the chances of living animals being attacked are almost negligible. Burying carcases to a depth of at least 2 feet prevents the development and emergence of flies. This depth may be reduced to a few inches if the animals are buried before infestation. Protection of wounds from flies is essential. Man, especially when subject to chronic catarrh, should not sleep in the open without the protection of a fly net; hospitals should be carefully screened and wounded animals should be placed in screened stalls or have the wounds treated with pine tar or other repellent substance. Infestation of sheep at lambing time may be prevented to some extent by lambing as early in the spring as feasible without danger from storms. Chloroform is the best destroyer of larvae. Certain mixtures containing carbon bisulphide sold for the purpose of destroying larvae have proved somewhat attractive to the adult. The disposal of slaughterhouse offal by burning or deep burying will largely prevent the rapid increase of the flies. The sun often destroys a large percentage of larvae developing on a carcass. Where dead animals are not burned or buried, it is important to leave them exposed to the sun rather than in shady places, as is commonly practised.

STEVEN (W. S. R.). **Report on an Investigation in Regard to the Prevalence of Malaria amongst the Troops stationed at Karachi, 1913.**—*Jl. Royal Army Medical Corps, London*, xxiv, no. 3, March 1915, pp. 251–261.

The military camp at Karachi was found to be infested with Anopheline mosquitos, chiefly *Anopheles* (*Neocellia*) *stephensi*, while a few *Anopheles* (*Cellia*) *pulcherrima* and *A.* (*Nyssomyzomyia*) *rossi* were present. The camp was a definite source of disease to any troops using it, owing to the presence of an infested stream on the west side and a tank bounded on one side by a bank covered with refuse on the north side. A small swamp in which Anophelines were breeding was ordered to be drained. Within the cantonment limits, mosquitos were found to breed in enormous numbers in catch-pits and garden tanks, *Stegomyia* and other Culicines being more abundant than Anophelines. The most important breeding place was a stream at the rear of the lines, which was fed mainly by subsoil water. Weeding and trimming the whole stream rendered it free from larvae for some weeks, but it is advisable to convert it into a large cemented channel with a small central bed. During the period of investigation the only measures in force for protecting the cantonment area consisted of a mosquito brigade composed of one soldier and two coolies. Arrangements were made for the extension of this scheme during 1914. The reports of a committee of the Municipal Council showed that effective work could be done by the provision of more efficient drainage of swamps, and by the education of the native population. The proximity of the native bazaar to the barracks was an important point, as numerous wells in the neighbourhood were found to contain Anophelines, *Culex fatigans* and *Stegomyia fasciata*. The provision of a better water supply would make the use of wells and water-storage vessels unnecessary, but the problem is a difficult one, owing to the height of the subsoil water everywhere. The much heavier rainfall in 1913 was the direct cause of the great increase in malaria. The presence of a small fish, *Lebias dispar*, living in fresh or brackish waters, was responsible for the absence of larvae in various streams, etc., which otherwise appeared to be excellent breeding places.

Cases of sand-fly fever at Manora were rare, although *Phlebotomus* was abundant.

MARETT (Capt. P. J.). **Sanitation in War.**—*Jl. Royal Army Medical Corps, London*, xxiv, no. 4, April 1915, pp. 359–366.

This paper deals with the suppression of flies in an area occupied by a large body of troops of all arms. Since there must be men in every camp who at some time have suffered from enteric or allied diseases, and have become carriers, if their excreta be exposed to insects, such as flies, these will become infected and spread the virus. Under these conditions, all flies must be treated as potential carriers, and everything possible must be done to prevent flies from breeding, to kill all flies when found, and to keep them from foodstuffs, latrines, and infected patients.

In Rouen the problem of the disposal of manure is a difficult one, owing to the large accumulation and the lack of transport. It has been dealt with in three ways. Heaps are made of old manure, which are dusted with quicklime, covered with earth, and planted with grass and other seeds. As much manure is burned daily as is possible and it is proposed to build incinerators to assist this. A narrow-gauge line has been laid to a natural depression, where the manure is dumped and covered with quicklime and earth and then planted over. As flies shelter at night in buildings and tents, buildings can be sprayed with paraffin, while tents should be rolled up at dawn and the flies in them killed. The best fly-bait is a five per cent. solution of formalin in a plate to which lumps of sugar are added. A stronger solution would be left untouched owing to its odour. To protect foodstuffs, dining-huts and kitchens should be fly-proofed. Foodstuffs requiring special attention are jam, butter, cheese and bread, all of which are good media for bacterial growth. In latrines, as elsewhere, the best deterrent is paraffin.

MALLOCH (J. R.). **The Chironomidae, or Midges, of Illinois, with particular reference to the Species occurring in the Illinois River.**—*Bull. Illinois State Laboratory Nat. Hist. Urbana, Illinois*, x, May 1915, pp. 275–543, 24 plates. [Received 26th July 1915.]

This paper contains descriptions, with keys to the genera, of the family CHIRONOMIDAE, of which the CERATOPOGONINAE are blood-suckers. The larvae of the genus *Culicoides* are aquatic and, so far as known, all the species are blood-suckers in the adult stage. *C. varipennis*, Coq., was taken on a cow and *C. guttipennis*, Coq., on a horse; *C. sanguisugus*, Coq., was found in company with *C. varipennis*, Coq., hiding in evergreens during the day and attacking a horse. *C. phlebotomus*, Will., occurs in St. Vincent, West Indies, as well as in Illinois. *Pseudoculicoides cinctus*, Coq., is recorded as attacking man in Florida. The following species are described as new, *C. multipunctatus*, *C. hieroglyphicus*, *C. haematopotus* biting man, and *C. crepuscularis*.

THOMPSON (R. L.). **Some Household Insects.**—*Dept. Agric., Salisbury, Rhodesia*, Bull. no. 214, June 1915, 11 pp.

The life-history of *Musca domestica* in Rhodesia is as follows: the larvae hatch in from 12 to 24 hours after oviposition, reach maturity in from four to six days, adults emerging in about three days. Oviposition begins from 4 to 14 days later. Control measures must be based on the destruction of breeding places. The most important fact in this connection is that the larvae cannot feed on dry substances. In Rhodesia, the chief breeding places are the open manure heap and the cattle kraal. In the dry season, the number of flies could be enormously reduced by spreading stable manure thinly over the land every few days to enable it to dry rapidly. The value of the manure as a fertiliser is said to be increased by this method. Chloride of lime, Jeyes' Fluid or 1 per cent. arsenite of soda can be used on a small scale for destroying the larvae. Adult flies in houses can be controlled by means of one part formalin in 15 parts milk and water or by a sweetened solution of arsenite of soda. Flies in stables have been reduced by means of a hanging branch sprayed every two days with a solution of ½ lb. arsenite of soda and 4 lb. sugar in 4 gals. water.

Stomoxys is abundant during the wet season. The breeding places consist of rotting hay or grass, or stable litter containing a proportion of straw. Pure manure does not attract this fly to any extent. The larvae require more moisture than do those of *M. domestica* and almost complete darkness. The shortest larval period recorded is about 11 days. The scattering and drying of all infested matter is a valuable control measure. The suppression of this fly is important to dairymen, since its presence may lead to marked diminution in the yield of milk. This insect caused the fly plague in Zululand in April 1914, which resulted in injury or death to many cattle and horses. A repellant mixture of fish oil and paraffin is generally recommended, but only gives temporary relief.

Cordylobia anthropophaga was abundant during the last two rainy seasons. The eggs or living young are deposited on the sleeping places of man and domestic animals or directly on the skin of the host. The larva bores into the skin, producing a boil. Maturity is reached in 14 days, when the larva emerges, falls to the ground and pupates in the soil or flooring. The adult emerges after 16 days. The obvious remedy is to squeeze out the larva and to wash out the cavity with an antiseptic. For prevention, all woollen clothing should be ironed and placed in a closed receptacle. The sleeping places of animals near houses should be cleaned at frequent intervals.

Natives who sleep directly on the ground are liable to attack by the floor maggot [*Auchmeromyia luteola*]. Their beds should therefore be raised, or the floors of the huts soaked at intervals of from 10 days to six weeks with a solution of 1 oz. carbolic acid in 1 gal. water, Jeyes' fluid or paraffin. Under favourable conditions, pupation takes place two weeks after hatching. Adults may emerge in 11 days, but, under winter conditions at Salisbury, the pupal period lasts for five or six weeks.

Experiments for the control of flesh flies attacking meat have shown that flies emerged from infested meat when the latter had been buried to a depth of 2 feet. Destruction by burning is therefore recommended.

The Plasmoses of Cattle.—*Rhodesia Agric. Jl., Salisbury*, xii, no. 3, June 1915, pp. 360–361.

During 1914, the plasmoses of cattle continued to cause enormous losses to stockowners owing to the serious shortage of bulls, the heavy mortality of young animals, more especially of grade stock, and the anaemia and consequent loss of size, vigour and maturity of all bovine animals due directly or indirectly to these diseases. Indigenous cattle are comparatively resistant to the plasmoses, while the mortality of cattle introduced for the purpose of improving the type has proved very great. Attempts to produce immunity against these diseases have met with varying success. It was found that animals bred on dipped areas, when removed to tick-infested veld, contracted redwater and frequently died. Until dipping is universal, its practice is attended by marked disadvantages in limiting the movement of stock born on clean areas. Although redwater yields readily to regular dipping, anaplasmosis is not easily eliminated. Blood, taken from cattle from dipped areas and inoculated into cattle newly arrived from Great Britain, produced a marked anaplasmosis reaction. In one case blood from a nine months old heifer, born and running since birth on an area where five-day dipping had been practised under Government supervision for five years, caused no redwater, but gave rise to a severe anaplasmosis, from which the inoculated animal died. It would appear therefore that the ideal method of dealing with these diseases is to supplement regular dipping with a simple and safe method of protective inoculation. The first series of experiments undertaken to discover a specific therapeutic agent against anaplasmosis was unsuccessful. A second series was conducted to discover and test various strains of virus which would give rise to a mild form of plasmosis, followed by a marked degree of immunity or tolerance. Twelve imported shorthorn heifers were used for the purpose. A favourable virus was obtained and six of the animals suffered from mild reactions from which they recovered. They were then exposed to natural tick infection, which it is believed they will be able to resist. The virus is now being tested on the remainder of the heifers, and if good results are obtained, the inoculation of imported stock will, in the near future, be carried out more successfully than formerly.

BUCK (J. E.). **Fly Baits.**—*Alabama Agric. Expt. Sta., Auburn,* Circ. no. 32, June 1915, 6 pp., 1 fig.

During the summer of 1914, tests were made for the purpose of determining the relative attractiveness of a number of fly baits. Dr. A. W. Morrill's work in this connection [see this *Review*, Ser B, ii, p. 159] being perhaps the most extensive effort made up to then. The twelve most important baits are recorded in the order of their attractiveness, the first three being: (1) Light bread, buttermilk (to which 7 per cent. of commercial, 40 per cent. formaldehyde had been added) and a little sugar or syrup, preferably the latter; (2) light bread and equal parts of sweet milk and water to which had been added 5 per cent. of commercial formaldehyde and a little sugar; (3) light bread, sweet milk containing 10 per cent. grain alcohol (95 per cent), and a little sugar. Another bait consisted of fish scraps and this was tested once with three others. Of the 1,759 flies caught, the fish caught 13·24 per cent.; decaying banana 19·72 per cent.; buttermilk with 3 per cent. grain alcohol and a little sugar used on light bread, 43·21 per cent.; and sweet milk containing 5 per cent. of formaldehyde used on light bread with a little sugar, 23·82 per cent. Fish scraps have been used with good results in towns and these figures show how this bait compares with some of the best baits found in these tests. In using the liquid baits, the light bread is first put in the bait pan; the liquid bait (which should be made up in sufficient quantity and kept tightly corked) is poured on the bread and the sweetening is then added. For a bait pan holding about one-eighth of a pint, two dessert-spoonfuls of white sugar should be added; slightly more syrup than sugar should be used. Syrup gives better results with the buttermilk baits, sugar with the other baits. Bait receptacles should be made of glass or some substance not easily corroded, as chemicals may act on tin or zinc and prove repulsive to the flies. Plenty of fresh bait should be added regularly and all old bait should be thoroughly cleaned out about once a week.

ALDRICH (J. M.). **The Deer Bot-Flies (Genus *Cephenomyia*, Latr.).**—*Jl. New York Entom. Soc., Lancaster, Pa.*, xxiii, June 1915, pp. 145–150, 1 plate.

Four species of *Cephenomyia* have been recorded from Europe; these are, *C. auribarbis*, Mg. (*rufibarbis*, Mg.), in the stag; *C. ulrichii*, Br., in the elk; *C. trompe*, L., in the reindeer, and *C. stimulator*, Clark, in the roe. All these species live in their larval stages in the nasal passages, on the soft palate, at the base of the tongue, or in the Eustachian tubes and pharynx. They are sometimes found in large numbers in the host, especially in spring, when they may cause death. *C. grandis* has been recorded from Patagonia. In North America, the larvae of *C. ulrichii*, have been taken from the throat of an elk. Other species have been found in the throat of *Cervus mexicanus* in Mexico, in the nasal passages of man near San Bernardino, Cal., and in the larynx of a mule deer at Aragon, N.M. The behaviour of the flies varies; *C. auribarbis* does not fly far from the haunts of its host, while *C. stimulator* and *Pharyngomyia picta*, Mg., are very active. The deposition of the larvae has been observed in *C. auribarbis*. Each time the female approaches the nasal openings of the host, a drop of fluid containing active, living larvae is deposited; the larvae become attached by their hooklets and induce a violent sneezing on the part of the animal attacked. Young larvae of *C. trompe* have been found attached to the hairs of the abdomen of the host. *C. abdominalis*, sp. n., is described.

BIRT (Colonel C.). **Phlebotomus or Sandfly Fever.**—*Brit. Med. Jl., London*, 31st July 1915, pp. 168–169.

After reviewing the symptoms and course of the disease, the author says that the susceptibility of British troops in India to sandfly fever is very high. Sometimes more than half a regiment has been attacked during its first hot weather. Ninety-five per cent. of all the cases occur in individuals who have resided two years or less in the endemic area. A high degree of immunity is afforded by the fever and second attacks occur in only 5 to 10 per cent. of the cases, though relapses are sometimes caused by excessive exercise during convalescence. In twenty-one experiments the bites of sandflies, which had been fed seven to twelve days previously on sandfly fever patients during the first day of their illness, gave rise to the disease. In Poona, *Phlebotomus* is scarce and admissions for sandfly fever are few. In the north-west of India these flies are abundant and the fever is very prevalent.

GRAHAM (Capt. G. F.). **Sandfly Fever in Chitral (N. India).**—*Brit. Med. Jl., London,* 31st July 1915, pp. 169–170.

During the three years 1911–13, the author has studied between 700 and 800 cases of sandfly fever in its epidemic form in Chitral. So far as India is concerned, this fever is probably not of recent appearance, but has previously passed under various names, as Peshawar fever, or pyrexia of uncertain origin. It appears to be a rare disease in the tropical zone, being much more frequently found in subtropical regions, and especially in stations at the foot of the Western Himalayas. The disease is present throughout the whole of the Peshawar-Chitral Valley at all levels below 7,000 feet. The highest level at which *Phlebotomus* was found was 6,500 feet. The disease is strictly limited to the summer months, between May and September, and it is only during these months that sandflies are prevalent. A very dry season appears to favour the spread and severity of the epidemic. During the months from June to August, there is practically no rainfall in Chitral. Heavy rainfall, which occurred on one occasion, appeared to reduce the incidence of the fever somewhat, possibly by killing off some of the infected sandflies. The cold winter months, when the temperature frequently drops to 10° to 15° below freezing point, are most probably survived in the egg-stage.

Phlebotomus papatasii and *P. minutus* both occur in Chitral. Large numbers could be caught daily in the barracks of the forts during the summer months. Owing to their small size, they can easily pass through the meshes of the ordinary mosquito curtain used everywhere in India, which necessitates the use of one of much finer mesh. They exist in large numbers in all buildings, especially on the walls and near the ceilings or the roof during the daytime.

As regards racial incidence, in Chitral, it is remarkable that Europeans and Gurkhas suffer to the extent of from 60 to 80 per cent., while other members of the garrison, who have previously lived mainly in the plains of the Punjab, are practically free from the fever. The indigenous natives themselves do not appear to suffer from the disease except in early infancy. As a rule, one attack confers immunity against fresh attacks, though this is by no means constant. Experience has proved that if the troops of the garrison can spend the three or four fever months of the hot weather under canvas at an elevation of anything over 7,000 feet not a single case of sandfly fever will occur amongst them, while any troops remaining in the fort, which is situated at an elevation of just under 5,000 feet, will contract the fever to the extent of nearly 80 per cent. during the epidemic season. Very early isolation should be strictly carried out and all cases should be kept under a fine mesh sandfly-proof curtain. A similar curtain should be used by all persons living in an infected area. The demolition of all unnecessary buildings and old walls, which are ideal haunts for the sandfly, is desirable. Fumigation of barracks has been tried, with temporary good results in some cases, numbers of sandflies having been killed off by this means.

HOUSTON (Capt. J. W.). **Sandfly Fever in Peshawar.**—*Brit. Med. Jl., London*, 31st July 1915. pp. 170–172.

Phlebotomus papatasii and *P. minutus* are present at Peshawar, the former being by far the more numerous and widely distributed. Sandfly fever makes its appearance with considerable suddenness about the middle of April annually, a time which coincides with the appearance of numbers of *Phlebotomus*.

MARETT (Capt. P. J.). **The Bionomics of the Maltese** *Phlebotomi*.—*Brit. Med. Jl., London*, 31st July 1915, pp. 172–173.

The species of *Phlebotomus* select for their breeding places spots which are dark, damp, and usually inaccessible, with a requisite temperature and a suitable food supply. That darkness is the natural condition may be deduced from an examination of the larvae, which are devoid of eyes, their place being taken in the adult larvae by two patches of pigment. A certain amount of moisture is necessary for two reasons, one, because if placed in dry surroundings, the larva will shrivel up, and the other, because the food of the larva being excretal matter, it cannot be eaten when in a dry condition. Excess of moisture is equally harmful, as has been experienced in breeding experiments, where excessive spraying of a breeding dish resulted in the loss of all the larvae. Quiet is essential, as the larval stage is somewhat lengthy, and inclement weather during this period has a fatal result. The proper food supply of the larva has been found to be the excreta of the various insects and animals found in walls. Special attention has been paid to the excrement of woodlice, lizards and bats, and undoubtedly in experimental breeding that of woodlice gives the best results. The requisite temperature for active breeding is above 70° F.; below 60° F. larvae appear to become dormant in the detritus, whilst the higher the temperature is above 70° F. and up to 86° F. the more rapid is the life-cycle. All these conditions are to be found in the interior of rubble walls, in crevices of caves, artificial embankments, and, in Malta, especially in the interior of the old bastions, many of which contain disused chambers. In searching these places, the number of larvae and pupae found was not in proportion to that of the adults, but this was due to the fact that the larvae bury themselves, while of the pupae, only those adhering to stones were found. In experimental breeding only about 5 per cent. of pupae so attach themselves, the remaining 95 per cent. lying free on or under the detritus. According to Newstead, *P. papatasii*, Scop., *P. perniciosus*, Newst., and *P. minutus*, Rond., are present in Malta. *P. papatasii* breeds in caves and in embankments, whilst *P. perniciosus* and *P. minutus* breed chiefly in the rubble walls and in bastions, the result being that the two latter species are seen more often in dwellings, unless caves and embankments are in close proximity. The flies appear about the middle of May, in small numbers, and by the end of June they are numerous; during July, when the breeding grounds are somewhat dry, their numbers decrease, and only on the onset of the damp sirocco, about the middle of August or beginning of September, do they increase once more, appearing then in far greater numbers than earlier in the year, and persisting till the onset of the rains and wind, about the middle of November. They can still be found in their breeding haunts in small numbers during December. The latest date on which a fly was seen was 14th January; this was in a breeding ground where the temperature kept up to 70° F. till January; on the temperature falling to 60° F., no flies were seen. There is thus an interval of about four months during which the adult fly is not to be found. The winter is passed in the larval stage. It has been found experimentally that dryness of the surroundings prolongs the length of the various stages, and under such conditions the complete cycle takes as much as four to five months, while when warmth and moisture are present, the shortest time has been found to be thirty-four days. The larva is motile and eats voraciously; when mature, its total length is about 5 mm.; it then becomes motionless, empties its intestinal canal, and curves its head over till it touches the abdominal surface; when about to pupate, it comes up to the surface of the detritus, unless it is dry. Bred flies usually feed before pairing, the females alone sucking blood. When pregnancy is short (seven days), the eggs are more likely to be fertile, and when this is the case, they are all laid within twenty-four hours. On warm nights the flies appear just before sunset; they are attracted to inhabited dwellings and bite both warm and cold-blooded animals. At sunrise they disappear, either to their breeding haunts, or to dark corners of rooms. They dislike sunlight, but are attracted by artificial light, and are to be found in considerable numbers on and around paraffin lamps. It seems probable that examples of *P. papatasii*, which were bred in a certain cave, were present in dwellings within fifty yards of it, but only rarely beyond this limit. They do not fly high, and the top rooms of houses which are not shut in by high walls are comparatively free from them. Sandflies are attacked by an ectoparasitic mite, which hatches in woodlouse excreta, and is to be found attached to the thorax of the fly; it apparently is not a true parasite, as it occurs when no flies are present and does not injure the larval stage. On the other hand a minute pseudoscorpion attacks the larvae. A fungus, pathogenic to the fly, has been provisionally named *Empusa papatasii*. A fly thus infected is recognised by the fact that ingested blood appears to remain in the thorax, causing it to appear nearly as red as the abdomen. On dissection of such a fly motile spores may be found in the salivary glands, whilst the mycelial form is seen in the intestines.

La destruction des mouches; l'assainissement des cantonnements et des champs de bataille. [The destruction of flies and the cleansing of cantonments and battle-fields.]—*La Vie Agric. et Rurale, Paris*, v, no. 10, 31st July 1915, p. 181.

If used too freely on manures, heavy coal oils and 5 per cent. solutions of cresyl may, in certain cases, injure the value of them, while heavy tar oil sinks to the bottom in water. These disadvantages do not attach to the residual oils of tar, that is to say, the oils deprived of their naphthaline content and dephenolised. Such oil, with the addition of resinate of soda, may be mixed with water in the proportion of $2\frac{1}{2}$ per cent. to form a stable emulsion, which may be spread in a thin film over extended surfaces of decomposing matter. The peculiar odour of this oil drives away all Diptera Brachycera and the deodorant power of the product largely reduces the stench of putrefying matter. The emulsion may be sprayed from hand-sprayers or from those in which carbonic acid gas actuates the jet, which may then reach as far as from 24 to 30 feet. This provides a means of spraying bodies at some distance in front of a trench without attracting the attention of the enemy.

Come si distruggono le mosche. [How flies can be destroyed.]—*Nuova Agricoltura del Lazio, Roma,* li, no. 62, 31st July 1915, p. 109.

The Lotrionte method of destroying *Dacus oleae* (olive fly) [see this *Review,* Ser. A, ii, p. 289, p. 452] is also efficacious for ordinary flies and horse flies. In stables, manure heaps, etc., the flies and their eggs may be destroyed by spraying with a solution containing: water, 100 parts by weight; molasses, 10 parts; and either arsenite of potash or arsenite of soda, 2 parts. The "capanette," peculiar to the Lotrionte method, should be used in houses.

Уничтоженіе вшей у домашнихъ животныхъ. [The destruction of lice on domestic animals.]—**« Земледѣлецъ.»** [*Agriculturist*], *Petrograd,* xx, no. 6, June 1915, p. 275.

To destroy lice on domestic animals, ½ lb. of ordinary soap, and 2 oz. of snuff tobacco are boiled in about 20 quarts of water, till the whole of the soap is dissolved; 4 quarts of kerosene are then added to the boiling solution, stirred and allowed to cool into a jelly. For use, 1 part of this jelly is dissolved in 9 parts of warm water and rubbed into the coat of the animals with a piece of cloth; four or five days after the second application all the lice disappear.

BRUCE (Sir David). **The Croonian Lectures on Trypanosomes causing Disease in Man and Domestic Animals in Central Africa.**—*Brit. Med. Jl., London,* nos. 2843, 2844, 2845 and 2846; June 26th, July 3rd, July 10th and July 17th 1915; pp. 1073–1078, 5–10, 48–53 and 91–97; 2 maps, 32 figs.

In these lectures, the noxious trypanosomes of man and animals in Central and Southern Africa are considered. The conditions which obtain on the East and West Coasts of Africa between 20 deg. N. and 30 deg. S. latitude are much the same as those which are found in the central parts, and it is probable that the same trypanosomes are found throughout. In describing the species found in the British Colonies, it may be assumed that all the important pathological species found in Central Africa are being dealt with, although in other places they may be known by other names. In the north of Africa, outside the range of the tsetse-flies, two trypanosome diseases are found, one of the horse (dourine) and another of camels (surra), the former conveyed from sick to healthy horses by contagion, the latter almost certainly by TABANIDAE. The wide distribution of these haematozoa is shown on a map of the world, and for the purposes of classification, the morphology of the various species of trypanosomes, the relative susceptibility of various animals and the effect of transmission on virulence and the mode of development in the invertebrate host are given. The life-history and habits of *Glossina morsitans* and *G. palpalis* are also dealt with.

In the second lecture, the relations of *Trypanosoma brucei* with *Glossina morsitans* and wild game, and its morphology are discussed at length; the methods of determining the infectivity of wild tsetse-flies are described and the necessity for the complete destruction of all wild game living in " fly " country is insisted on.

The third lecture is occupied by a recital of the history of the proof that *Glossina palpalis* is the carrier of *Trypanosoma gambiense*. The reduction, in certain areas, of the number of infected flies following removal of the natives, the cycle of development of the trypanosome in *G. palpalis*, and the position of cattle and wild game as reservoirs of the disease are discussed.

In the fourth lecture, *T. pecorum* and its development in the fly and the relation of *T. caprae* to *G. morsitans*, are dealt with. The opinion is expressed that, if big game were driven out of fly country, the diseases caused by *T. pecorum* and *T. brucei* would disappear; that epidemics may be stopped by removing natives from fly areas; and that clearing and cultivation would probably drive *G. palpalis* away.

SHIPLEY (A. E.). *Stomoxys*, **the Stable Fly.**—*Brit. Med. Jl., London*, **7th August 1915, pp. 216–218, 7 figs.**

The differences between *Stomoxys calcitrans* and *Musca domestica* are explained and the habits of the former described. *S. calcitrans* is common in farm buildings and in early autumn often comprises 50 per cent. of the flies in houses. It is believed to be able to produce fertilised eggs without having had a meal of blood. The larval stage is usually two or three weeks, but may be prolonged to 11 or 12 weeks by adverse conditions; the pupal stage is from 9 to 13 days. The whole life-cycle is usually completed in from 27 to 37 days. *Stomoxys* is chiefly of economic interest as a possible carrier of disease, especially of various forms of trypanosomiasis, such as surra. It is stated that certain threadworms, such as *Filaria labiato-papillosa*, which occur in the peritoneal cavity and sometimes in the eyes of cattle and deer in India, are undoubtedly conveyed by *S. calcitrans*. The superficial blood-vessels of the cattle swarm with the larvae of these threadworms, which readily pass through the proboscis of the insect into its stomach. They make their way through the walls of the stomach into the thoracic muscles, where they pass through a resting stage, and are subsequently transferred to a new host. Another serious disease with which this fly has been thought to be connected, is acute epidemic poliomyelitis or infantile paralysis.

The most efficient way of controlling this pest is to destroy its breeding places. All decaying vegetable matter should be either removed, burnt or buried, the chief methods which have been advocated for the common house-fly, being also applicable to *Stomoxys*. If stable manure is carefully removed, from May to October, at least every seven days, the number of flies would be materially reduced. Where this is impracticable, manure heaps should be covered with some insecticide, so as to destroy the eggs and larvae. Experiments are still being made with the view of finding a substance capable of killing the eggs, larvae, and pupae, which will be cheap and yet not interfere with the fertilising value of the manure. In America, borax or colemanite (crude calcium borate), calcined, powdered, and applied with a flour-dredger, is recommended. The proportions which seem most effective are 0·62 lb. of borax and 0·75 lb. of colemanite to 10 cubic feet or 8 bushels of manure. Two or three gallons of water should then be sprinkled over the manure heap.

JONES (H. Llewelyn). **The Treatment of Trypanosomiasis in Cattle caused by the** *Trypanosoma pecorum*.—*Jl. Comp. Path. Therapeut., London,* xxviii, pt. 2, June 1915, pp. 154-166, 1 map.

One of the estates examined is on the banks of the river Buzi, 30 miles from the author's headquarters at Beira, Portuguese East Africa. Trypanosomiasis has been in existence there since 1909, though tsetse-flies have never been found on the estate itself. It is supposed that the disease was introduced by oxen which were brought to the estates from a southern portion of the territory, but when and where those animals became infected, was never discovered. When the author first visited it in May 1912, there were on the estate 40 working oxen, 5 donkeys, 4 mules, 1 horse, 13 goats. Whilst searching for *Glossina*, the author caught the following biting flies: *Tabanus taeniola*, *T. gratus*, *T. fraternus*, *T. fuscipes*, *T. africanus*, *T. biguttatus*, *T. maculatissimus*, *Haematopota distincta*, *H. decora*, *Stomoxys nigra*, *S. omega*, and *Hippobosca maculata*. The horses and mules were housed at night, the other animals being kept inside a small, fenced area. Examination of the blood of all the animals on the 5th May 1912, showed that the following were infected with trypanosomiasis (*Trypanosoma pecorum*): oxen, 20; donkeys, 3; mules, 1; horses, 1; goats, nil.

In February 1913, a serious outbreak of trypanosomiasis, in which over 1,000 head of cattle died within six months, occurred in the neighbourhood of Beira. In searching for *Glossina*, the first kraal examined was on higher ground and further inland than the others, and there *G. brevipalpis* was found in fairly large numbers. The neighbourhood of this kraal is mainly covered with bush and small trees, the fly itself being found in more or less dense forest. About 13 miles to the north of this kraal, large numbers of *G. morsitans* were also caught. Search has been made at repeated intervals, throughout the various seasons since May 1913, in all the small wooded areas on the flats, but no *Glossina* has been discovered. Cattle have lived on these flats for over fifteen years, and cattle owners can only once remember similar symptoms in cattle, viz., in 1905. From 1906 onward, no cattle were sent to the forest. At the end of 1912 the Beira flats were so overstocked that about 800 head of Madagascar cattle were sent to the kraal near the forest. These cattle were the property of a butcher, who brought them back at intervals, in small lots, across the flats to Beira. The author is convinced that the disease was thus transmitted from sick to healthy animals on the lower ground through the medium of biting flies such as TABANIDAE and HIPPOBOSCIDAE which swarmed in the district. The flies were of the same species as those caught on the rubber and sugar estates, with the addition of *Tabanus ditaeniatus*.

Infected animals were removed from the herds and isolated during some months, and by October 1913, the herds that remained appeared free from the disease, though occasional cases were detected later. It is considered certain that, if tsetse-flies had been responsible for infecting so many animals on the flats, some trace of their presence would have been found. The transmission of the disease in these cases is therefore attributed to biting flies other than *Glossina*. Certain conditions appear to be necessary for such transmission, such as actual contact or very close proximity between infected and healthy animals and the presence of large numbers of biting flies. The transmission is thought to be of a mechanical nature, as the author has failed to transmit the disease to dogs by means of TABANIDAE which, four hours previously, had gorged themselves on sick cattle. Moreover, when the disease was raging on the eastern side of the railway, the cattle to the west, enjoyed good health, though the distance between them and the infected ones was very small.

WRIGHTSON (W. D.). **Mosquito Eradication and Prevention..**—*Amer. Jl. Trop. Dis. & Prev. Med., New Orleans,* ii, no. 12, June 1915, pp. 738–752, 9 figs.

At Vera Cruz, Mexico, crude oil, direct from the wells at Tampico, was used for oiling with fairly satisfactory results. This Mexican oil has an asphaltic base and is very thick. After application with knapsack sprayers, sprinkling cans, buckets, etc., it had to be spread over the surface of the water with brooms. A larvicide was found which obviated this costly method, and was made as follows: 150 U.S. gals. of crude carbolic acid, of a specific gravity not greater than 0·97, was heated in a tank and 200 lb. of powdered resin dissolved in it; 30 lb. of caustic soda dissolved in 6 U.S. gals. of water was then added. The mixture should be stirred while hot. A simple apparatus for preparing this larvicide consisted of an old oil drum, about 100 bricks for a furnace and a 4-foot piece of pipe for a chimney. The bricks were built to form the three sides of a rectangular enclosure which served both as a firebox and as a stand on which the oil drum was laid horizontally above the fire. The chimney was fastened in a vertical position between the closed end of the brickwork and the end of the drum. A bunghole and a tap enabled the drum to be filled and emptied without removing it. This apparatus cost about 20s. and could produce 350 U.S. gals. of larvicide daily.

MITZMAIN (M. B.). **An Experiment with *Stomoxys calcitrans* in an Attempt to Transmit Filaria of Horses in the Philippines.**—*Amer. Jl. Trop. Dis. & Prevent. Med., New Orleans,* ii, no. 12, June 1915, p. 759–763, 1 plate.

Two hundred newly emerged *Stomoxys* were fed upon an Arab stallion whose blood was teeming with microfilariae on the day of feeding. The next day, 170 of them were engorged with blood containing a moderate number of active embryos. The flies were kept till the fourth day following without food, and during the five succeeding weeks they were allowed to feed, at varying intervals, upon four Filipino horses which had been used for a surra experiment that had failed, no filariae having been found in their blood for two months previously. Two hundred other laboratory-bred flies were allowed to feed on a healthy horse and records were kept of the mortality in both cases, with the result that in the first ten days twice as many of the filaria-fed flies died as of the controls. After ten days, the mortality among both sets of flies was practically the same. In the gut contents of one fly, fed on infected blood, a filaria was found in the act of being ingested by a polymorphonuclear leucocyte; this may possibly explain the non-development of many embryos ingested by the flies. Dissections of 31 flies from the fifth to the eighth day after a meal of infected blood, showed in these cases larval worms embedded in the muscles of the thorax. After the eighth day, no evidence of parasite invasion could be discovered. The five horses were kept in screened stables throughout the experiments and though examination of the blood of the four healthy animals was made two or three times weekly for 60 days after the last feeding by the infected flies and again a month later, no evidence of infection could be discovered.

BISHOPP (F. C.). **A Point to be considered in Utilizing the Duck as a Mosquito Destroyer.**—*Amer. Jl. Trop. Med. & Prev. Dis., New Orleans,* ii, no. 12, June 1915, pp. 767–768.

There is a point, in connection with the habits of ducks, particularly when kept rather closely confined, which under certain circumstances may somewhat detract from their value as mosquito destroyers [see this *Review*, Ser. B, iii, p. 25]. Where they are confined in yards of which the ground is rather moist, they often dig holes—sometimes to a depth of from 4 to 6 inches. These holes form admirable breeding places for mosquitos and are frequently hidden by a partial or complete covering of grass.

HEWITT (C. Gordon). **The House-Fly.**—*Cambridge University Press,* 1914, 382 pp., 3 coloured plates, 101 figs. Price 15*s*. net.

There is no insect which has had so much written concerning it in the last ten or fifteen years as *Musca domestica*. It shares with the mosquito the honour of being the greatest insect enemy of mankind, and accounts of its structure, life-history and habits with their consequences to man, now require a volume of some size. The anatomy of the insect and larva is minutely described and fully illustrated; its general habits and bionomics are stated in detail, and in discussing the question of the mode of hibernation, the author appears to consider that it can scarcely be doubted that this takes place as an imago and that those flies which hibernate are the most recently emerged and therefore the most vigorous. The abdomen of a hibernating individual is packed with fat cells, the fat-body having developed enormously and the alimentary canal having shrunk correspondingly. The fat-body provides sustenance during the hibernating period, and is extremely small when flies which have hibernated are dissected in May and June. The natural enemies and parasites of the house-fly include the pseudo-scorpion, *Chermes nodosus*, Schr., which perhaps can hardly be regarded as a true enemy, as it is possibly seeking *Trombidium* and other mites which infest the fly. A chapter is devoted to *Empusa muscae* and it is pointed out that the precise means by which the infection with this fungus is carried over from one year to the next is not actually known, while the difficulties of cultivating the fungus artificially are referred to. The results of Bernstein's and Ramsbottom's researches have been published since Dr. Hewitt's book went to press [see this *Review*, Ser. B, iii, pp. 89 and 90]. Other species of flies frequenting houses: *Fannia canicularis*, L., *F. scalaris*, F., *Stomoxys calcitrans*, L., the blow-flies *Calliphora erythrocephala*, Meig., *C. vomitoria*, L., and *Lucilia caesar*, L., *Pollenia rudis*, F., and *Muscina stabulans*, Fall., are fully dealt with. A chapter is devoted to miscellaneous flies found in houses such as *Musca domestica* subsp. *determinata*, Walk., *Musca euteniata*, Big., *M. vetustissima*, Walk., the root-maggot fly (*Anthomyia radicum*, Meig.) and the moth flies (PSYCHODIDAE). The relation of flies to various diseases and the species implicated in causing myiasis and the spread of intestinal worms, occupy 100 pages of the book and form a very full account of the subject. One chapter is devoted to control measures and the concluding one to the serious need for organised action, especially in the protection of food exposed for sale. A bibliography of over 600 works, mainly very recent, which the author does not pretend is by any means complete, is evidence, if any were needed, of the importance of the position to which the house-fly and its congeners have attained in the last twenty years.

DOTY (A. H.). **The Extermination of the Mosquito.**—*Jl. Amer. Med. Assn., Chicago*, lxiv, no. 22, 29th May 1915, pp. 1836–1838.

The mosquitos of the United States are divided into two classes: the inland mosquitos, such as *Stegomyia* and *Anopheles*, and the coast mosquitos, such as *Culex sollicitans*, or the Atlantic Coast mosquito, commonly known as the salt water swamp mosquito. The breeding grounds of the inland and of the coast mosquitos do not, as was formerly supposed, occur in the same places. *C. sollicitans* breeds only on the salt marshes along the coast, though it is often found inland; the inland mosquitos only breed in the interior and apparently remain near their breeding places. The variety of the breeding places of the inland mosquitos clearly indicates that little dependence can be placed on natural enemies or other factors in the extermination of these insects, which can only be effected by the destruction of their breeding places. The success of the work on Staten Island, where about 10 square miles of salt water swamp land was drained and freed from breeding places, furnishes indisputable evidence that *C. sollicitans* must be dealt with in the same way. Oiling is only a temporary measure and must not be accepted as a substitute for the permanent destruction of the breeding places.

SWINGLE (L. D.). **The Eradication of the Sheep-Tick.**—*Univ. Wyoming Agric. Expt. Sta., Laramie, Wyoming.* Bull. no. 105, January 1915, pp. 27–47. [Received 6th September 1915.]

An account of experiments made to determine the effect of certain dipping fluids upon immature and adult sheep-ticks [*Melophagus ovinus*] is given. Observations on the effect of Cooper's powder, Zenoleum, crude carbolic acid, and official lime and sulphur dip showed that in every case pupae hatched readily after one minute's immersion, while adults were not killed by the last-named dip. Laboratory tests were made with the following dips: Chloroleum 1 : 63, Carboleum 1 : 100, Cooper's Fluid Dip 1 : 150, Kreso 1 : 75, Chloro-naptholeum 1 : 50, Zenoleum 1 : 50, and 25 per cent. kerosene emulsion. Many pupae hatched after being dipped in each of these, except those dipped in kerosene, though 5 per cent. kerosene will not kill all the pupae, and a higher percentage cannot be used on the host. Variations occurred in the action of the same dip, indicating that certain physical or chemico-physical factors were involved. In every instance but one, the pupae of the controls began to hatch before those which had been dipped. This was probably due to the cooling action of the wet wool. The controls continued to hatch for several days after hatching had ceased among the dipped forms, showing that all the youngest pupae were killed by the fluid. The experiments indicate that more than one dipping must be made if the pest is to be eradicated. Since the dips will not kill all the pupae, the last dipping must be done after every pupa has hatched. In summer, the normal incubation period is 23 days. Experiments carried out to determine the effect of dipping on the duration of this period, showed that, if pupae were dipped before they were four days old, they were killed. Pupae dipped after the first four days usually hatched within 23 days. It is concluded that the possible prolongation of the incubation period by the first dipping need not be considered in determining when the last dipping should be made. In another series of experiments, the following fluids were found to be effective in destroying this parasite: Zenoleum, Chloroleum, Chloro-Naptholeum, Kreso, Minor's Fluid, Betz's Sanitary Fluid and Pyxol. Sanitary Fluid in the proportion 1 : 100 and Pyxol 1 : 200 were especially satisfactory. A detailed account of the effect of the dipping fluids on the parasites is given. With regard to the effects upon the sheep and wool, together with the ease of preparation of the dip, very little distinction can be drawn between the different coal-tar dips mentioned, except that crude carbolic acid tends to blacken the wool and is difficult to prepare. The cost of Cooper's Powder dip (an insoluble arsenical compound) is about twice as great as that of coal-tar compounds, but its effect on the parasite is similar and it has the advantage of remaining in the wool for some months. It is suggested that a suitable dip would be obtained by mixing Cooper's Powder with one of the coal-tar dips in about one-half the strength recommended for use. From the data obtained, it appears that at least three dippings about 14 days apart are necessary to eradicate the parasite. This conclusion is based on the fact that, in warm weather, the pupae require from 19 to 23 days to hatch and a young individual may reach sexual maturity in 14 days. Since dipping renders the conditions unfavourable, it is probable that at least three weeks are required for the parasite, when dipped, to reach sexual maturity. These theoretical results were supported by actual tests. Early autumn seems to be most suitable for dipping. With regard to the question of compulsory dipping, the author is of the opinion that *M. ovinus* would be eradicated in one year if the work were systematically carried out and owners were compelled to dip their flocks.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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YORKE (Warrington) & BLACKLOCK (B.). **Notes on the Bionomics of *Glossina palpalis* in Sierra Leone, with special Reference to its Pupal Habitats.**—*Ann. Trop. Med. Parasit., Liverpool.* ix, no. 3, July 31st 1915, pp. 349–362, 7 plates, 1 map.

The observations here recorded were made on the Cape Lighthouse Peninsula at the mouth of the Sierra Leone River, which is a pear-shaped piece of land about 3 miles long, 1½ miles broad at its base, and about three-quarters of a square mile in area, its seaward end, for two-thirds of the whole length, being barely 100 yards wide. The Aberdeen creek, which separates it from the mainland, is fringed by a dense growth of mangroves, in some places half a mile broad. Oil palms are found all over the peninsula with a dense undergrowth of young palms and these, though other trees are present, constitute the principal vegetation. *Glossina palpalis* is to be found in fair numbers all over the area at the beginning of the dry season, December to January, and cases of sleeping sickness have occurred in the vicinity. The chief object of the investigation was the study of the pupal stage of the fly, and in the first place examined, the hollow trunk of a baobab, 18 empty pupal cases were found under dead leaves lying on a fine dry gravel or within half an inch of the surface. The tree was 100 yards from the sea and not less than 450 yards from the nearest fresh water. Pupal cases were only found within a foot of the trunk and not in the centre of the floor of the cavity. A number of other likely places were searched, but without success, only two cases being found, one at the base of a palm tree close to the sandy shore and one at the base of a similar tree in dense bush. A systematic search was then made round the base of oil palms, trunks of which are difficult of approach, because of the dense barrier, 3 feet wide, formed by the lower petioles which completely shade the ground. On removing dead leaves and debris, 20 empty pupal cases were found, nearly all on the surface of the gravelly soil and about a foot from the trunk; the deeper layer of soil contained very few cases. By careful examination of the soil round many palms, large numbers were found, 10 to 20 under one tree being common and in two cases about 75 were collected. In only one instance was a puparium found in the earth in the angle between the petiole and the trunk. Puparia were very rarely discovered under other trees, the shade apparently being insufficient. The authors summarise the results of their observations as follows:—The breeding grounds of *G. palpalis* are not so strictly limited to the immediate vicinity of water as has hitherto been thought; they may occur quite independently of fresh water and at least a quarter of a mile from sea-water. Although *G. palpalis* is to be found in considerable numbers in mangrove swamps and may travel in these to a distance of at least half a mile from dry land, the swamps do not constitute a breeding ground of the fly. The pupae of *G. palpalis* do not hatch when subjected to daily flotation in sea-water. The ground round the trunk of oil-palms (*Elaeis guineensis*), which have not been stripped of their lower petioles, constitutes an excellent breeding place for *G. palpalis*, which can breed in localities in which this is practically the only tree. Stripping the oil-palms of the lower petioles would suffice to destroy the breeding ground in such places.

YORKE (Warrington) & BLACKLOCK (B.). **Food of *Glossina palpalis* in the Cape Lighthouse Peninsula, Sierra Leone.**—*Ann. Trop. Med. Parasit., Liverpool*, ix, no. 3, 31st July 1915, pp. 363–382.

Two hundred *G. palpalis* were examined as to the nature of the contents of the gut; recognisable mammalian red blood corpuscles were found in 14 and nucleated red corpuscles in 2 cases, 7 and 1 per cent. respectively. Man and his domestic animals would supply the former, while birds and lizards are abundant enough to furnish the latter in quantity. In over 90 per cent. of flies, red cells can be distinguished 24 hours after a feed, but only 40 per cent. 48 hours after, while after 72 hours, no definite red cells could be found. Avian corpuscles were found to endure longer, 100 per cent. after 24 hours, 60 per cent. after 48 hours and 40 per cent. after 72 hours; 64 flies were used. What food, other than blood, tsetse-flies take, is difficult to decide, but recorded observations tend to show that plant-juices are consumed. Experiments as to whether starved flies could take up fluid directly, gave negative results, and Rodhain's method of causing the flies to take up fluid through a membrane of fresh rat's skin was tried. The flies were kept at a temperature of 80° to 86° F., and it was found that neither shed blood nor other fluid which is not covered by a membrane, can be imbibed by *G. palpalis*. The fly can however take up through a membrane of fresh skin, not only blood and various dilutions of it with normal saline, but also suspensions of red blood-cells in normal saline, and solutions of haemoglobin (both freshly made from red blood cells, and the dried crystalline preparations of commerce) in distilled water. Fluids other than blood, such as solutions of sugar, sodium chloride, and glycerine, in water containing a small quantity of a dye (methylene blue, neutral red or fuchsin), are also taken up through a membrane of fresh skin, but not so quickly or so readily as is blood. *G. palpalis* exhibits a definite selective taste for the various fluids presented to it under the membrane, blood, red cells, and haemoglobin solution being much preferred. The attractive element in the blood is the fraction of the red cells soluble in water, probably haemoglobin. Examples of *G. palpalis* which have been starved for a day or two, can often be seen to insert the proboscis repeatedly into oranges, bananas or other fruits which may be offered them, and it is concluded that this fly in nature, may, under certain conditions, imbibe fluids other than blood.

YORKE (Warrington) & BLACKLOCK (B.). **The Reservoir of the Human Trypanosome in Sierra Leone.**—*Ann. Trop. Med. Parasit., Liverpool*, ix, no. 3, 31st July 1915, pp. 383–390.

It is contended that Kingborn and Yorke have shown that the chief reservoir of the human trypanosome of South Central Africa (*T. rhodesiense*) is the antelope and not man. The antelope is tolerant of the infection, while man is not, and the distribution of antelopes in South Central Africa practically coincides with that of *Glossina morsitans*. In Sierra Leone, the infection is extremely chronic and man is therefore a more constant and dependable reservoir than in Rhodesia or Nyasaland; further, large game is more or less rare in Sierra Leone and the prevalent fly is *G. palpalis*, which frequents water-courses and therefore the haunts of man more closely than the ubiquitous *G. morsitans*.

Cattle are largely imported into Sierra Leone, and the authors discovered in the blood of an ox a trypanosome indistinguishable from that infecting man, viz: *T. gambiense*. The infected ox was apparently in perfect health four months after the trypanosomes were found in its blood. The number of infected oxen in the district is difficult to determine; the blood of 90 animals was examined and 9 subinoculations into rats were made, but as rats are not very susceptible to the infection, the failure of the experiments is thought to prove nothing. Macfie considers that, in the Eket district [see this *Review*, Ser. B, iii, p. 53], man is not the reservoir and that the true reservoir is unknown; his inoculation experiments were negative, but the authors consider that the want of susceptibility of the rats and guineapigs used somewhat vitiates the conclusion. They believe that, in West Africa, man is the most important reservoir and that there is also reason to suspect domestic animals.

YORKE (Warrington) & BLACKLOCK (B.). **Notes on Certain Animal Parasites of Domestic Stock in Sierra Leone.**—*Ann. Trop. Med. Parasit., Liverpool*, ix, no. 3, 31st July 1915, pp. 413–420.

The results of the examination of 400 wild *Glossina palpalis* caught on the Lighthouse Peninsula are given; twenty of these yielded trypanosomes, chiefly *T. congolense* and *T. vivax*, only in one case *T. gambiense*. Parasites apparently identical with those discovered by Macfie in cattle in Nigeria, were found in the blood of 20 to 30 per cent. of the cattle examined, and the authors regard it as hardly doubtful that the parasite in question is *Theileria mutans*, as the cattle were all apparently in good health. The ticks collected from 90 head of cattle were determined by Dr. Nuttall as *Margaropus* (*Boophilus*) *australis* and *Amblyomma variegatum*. About 5 per cent. of the cattle were infected with *Piroplasma bigeminum*. Serious epidemics of an obscure disease of cattle also occur.

CREEL (R. H.). **The Migratory Habits of Rats, with special Reference to the Spread of Plague.**—*Public Health Reports, Washington, D.C.*, xxx, no. 23, 4th June 1915, pp. 1679–1683, 1 map.

Details are given of some experiments made with captured rats at New Orleans where an epizootic of rat-plague occurred in the early months of 1915. Beginning at the water front the disease spread with some rapidity to the city boundaries. Two lots of rats were collected from various parts of the town and each batch was distinctly marked. The first lot, of 179 rats, was liberated on 28th March in the central residential quarter, where the animals could obtain food but could find little underground shelter. Injuries sustained in captivity led to 19 of these marked animals being found dead near the spot where they were liberated on the same or on the following day. Of the remaining 160 animals, one was retaken about a mile away within 48 hours. Within two weeks others were retaken as much as three or four miles away. On 8th April, a second lot of 113 rats was liberated in the wholesale provision warehouse district, where wooden culverts, drains, etc., abound. There was less incentive for migration and only 8 were retaken at any distance, while 60 of the 113 were captured at points in the vicinity within a period of four weeks. The rats would appear to have an instinctive desire to wander, as any "homing" instinct must be excluded in view of the circumstances attending their capture, liberation and recapture. In addition to obtaining data on rodent emigration, the experiment furnished an index to the efficiency of the trapping; 103 of the 179 rats in the first series were recaptured during the following month and of the 113 in the second series, 60 were recaptured in 26 days. All the rats used in the experiments had been examined and found free from infection.

FRICKS (L. D.). **Rocky Mountain Spotted Fever found present in South-eastern Montana.**—*Public Health Reports, Washington, D.C.*, xxx, no. 23, 4th June 1915, pp. 1694–1695.

On 25th April 1915, cases of Rocky Mountain spotted fever were reported from south-eastern Montana, outside the supposed area of distribution of *Dermacentor andersoni* and *D. modestus*. All the cases seen were of the mild type observed in Wyoming and all were recovering. An investigation of grazing conditions showed that south-eastern Montana was formerly a horse and cattle country and that subsequently sheep superseded them to a considerable extent. About five years ago, dry farming was first undertaken in this district. The farmers occupied the water-holes and settled along the small water-courses, thus in turn driving the sheep away from the settlements. Each farmer brought a few horses and milk cows and thus established a breeding place for ticks in his immediate vicinity. Tick infestation has greatly increased during the last few years; all the specimens collected by the author were *D. andersoni*.

COOPER (W. F.) & WALLING (W. A. B.). **The Effect of Various Chemicals on Blow-fly.**—*Ann. App. Biol., Cambridge Univ. Press*, ii, nos. 2 and 3, July 1915, pp. 166–182.

The experiments described in this paper were made with the object of determining the insecticidal effect of various chemicals the bulk of which have never been actually employed as insecticides. Most of them are articles of commerce and the others, if found effective, could be produced on a commercial scale. The larvae of *Calliphora vomitoria* were used for the experiments, but some of the results were interfered with by the attacks of an unidentified Chalcid. Maggots were at first bred on horse-flesh, but, the supply proving inadequate, they were purchased of dealers in anglers' requisites. It was after the use of the purchased maggots that the Chalcids appeared and caused a mortality which in some cases exceeded that amongst the chemically treated larvae. The method of experiment was as follows: slabs of horse-flesh about 1 lb. in weight were placed in shallow cardboard boxes and the exposed surface was dusted over with the reagent, suitably diluted with precipitated chalk. The boxes were then exposed to the flies and daily note taken of any "blowing"; controls of untreated meat were similarly exposed. Forty-three different chemicals were tried in this way, and the results are set out in a table showing the strength of the chemical used and the number of days before the flesh was "blown." In 18 out of the 43 cases no "blowing" occurred; the controls were all badly "blown" within 7 days; in 15 cases the treated meat was blown within 6 or 7 days; in five cases, in 11 days; in two cases in 13 and in three cases in 17 days; the chemicals which delayed attack by the flies longest were sulphur, β-naphthol and borax. Arsenic sulphide, nitrobenzene, eucalyptus and clove oil, and oxalic acid delayed it for 11 days. Lavender oil, aniseed oil and ginger seemed to have little effect, as the meat treated with them was attacked within 6 days. The means by which immunity was conferred in the case of certain chemicals is not known, but the authors regard the effect as being produced through the sense organs of the fly and that either the smell or taste of the compounds was repellent or that, by preventing decomposition, the attraction of the meat for the fly was absent. Precipitated chalk is a very cheap and excellent vehicle for such insecticides and can easily be obtained in so fine a powder that it can be blown into the wool of sheep as a spray and would have no harmful effect upon it.

Experiments were made on larvae with various chemicals (*a*) with a powder basis, (*b*) with emulsions, (*c*) with vapours. Pieces of fresh sheep-skin, 12 inches by 8 inches, were nailed to a large board, wool uppermost, with strips of wood between them to prevent the larvae from migrating from one piece to another. Although with zinc oxide and arsenic sulphide nearly 70 per cent. of the larvae did not pupate, the method was not successful, as the skins dried up or decomposed and the larvae bored through them and pupated underneath out of reach of the powders. In another experiment, a definite number of larvae were shaken with the powder so as to be well covered by it and then transferred to a glass jar containing sand or sawdust; the jar was covered with muslin and the number of flies which developed noted. With arsenic sulphide, 88 per cent. were killed in sawdust, as against 8 per cent. in the control, and in sand, 68 per cent. as against 36 per cent. in the control. Other chemicals gave relatively high figures, but the mortality in the control in sand sometimes exceeded that of the treated larvae, and death from starvation or the varying resistance of larvae of different ages to the reagent suggested itself as vitiating the result. The experiments were therefore repeated, the larvae being separated into young and old. The results were somewhat erratic, but the young larvae were clearly much more susceptible to the poison than the old. With arsenic sulphide, 100 per cent. of young larvae died and only 16 per cent. of the old; nitrobenzene yielded the same figures; borax killed 100 per cent. of young and 20 per cent. of old larvae. The results seem to point definitely to the desirability in practice of applying any poison used as early as possible in the life of the larvae. It is stated that young larvae secrete a fluid which digests tissue and the resulting liquid is then reabsorbed, so that in their case the chemical acts in a sense as a stomach poison, whereas in old larvae the action is rather by contact. In a further series of experiments on old and young larvae, the chemicals were diluted with sand to one-tenth the previous strength and the larvae placed in it. Arsenic sulphide of only one-tenth per cent. killed all young larvae, and 68 per cent. of the older ones. The same applies to nitrobenzene, oil of cloves, turpentine, β-naphthol, creosote, boracic acid, fusel oil, sinapis oil and aniseed oil at strengths considerably below 1 per cent. When sawdust was employed instead of sand, the mortality was considerably decreased, but 46 per cent. of the young and 36 per cent. of the old larvae controls died, mainly, it is supposed, owing to the Chalcid parasite. These experiments tend to show that the high results obtained with sand could not be expected in actua practice on the fleece, owing to the higher absorptive power of the latter. The highly poisonous nature of arsenic sulphide, nitrobenzene and creosote is confirmed by this series of experiments.

Emulsions were tried as follows: 40 grms. of sawdust were sprayed with a 1 per cent. emulsion of the chemical to be treated until just damp, and 50 larvae were placed in it in a glass jar; saprol and a mixture of β-naphthol and sulphur were the only chemicals which gave good results. Vapours were tested by passing air, saturated with the vapour of the chemical, over the larvae for 3½ hours. They were then removed and placed in sawdust in glass jars; mono-bromobenzene, chloral hydrate, pyridine, ethyl acetate and iodine were the most effective. The authors are careful to state that these experiments are only preliminary and were made under laboratory conditions, and they regret that properly conducted field work under natural conditions is impossible in England.

MITZMAIN (M. B.). *Anopheles* as a Winter Carrier of Plasmodium; the Mosquito as a Prophylactic Indicator.—*Public Health Reports, Washington, D.C.*, xxx, no. 29, 16th July 1915, pp. 2117–2121.

It seems quite feasible to establish for any endemic focus the period of the year when mosquitos first acquire malarial infection. Thus a fairly stable indicator may be obtained of the time when there is a danger of the communication of malaria from man to man. It should also be possible to utilise this indicator to determine when prophylactic measures should be inaugurated in any locality or when they might be safely dispensed with. A locality which had been proved to have had a malarial index of 40·9 per cent. during September 1914 among 1,666 persons examined, was chosen for investigation. The work was done between 3rd February and 1st June 1915, near Scott, Miss. Material was obtained in and about habitations and in the woods and swamps. The first Anophelines were found with the aid of an electric torch, during the month of February, resting under the flooring of dwellings. They were collected daily, kept in glass bottles until evening, anesthetised with tobacco smoke and dissected. All possible hiding places were included in the search. In March, the woods afforded a more profitable collecting place, a horse being used to attract the mosquitos. This was continued through March and April, and discontinued when house infestation became general. In the region investigated, true hibernation does not occur and the question of hibernation was therefore not solved as a result of this study. Of the Anophelines dissected between early February and the end of May, there were 1,986 *A. quadrimaculatus*, 30 *A. crucians*, and 106 *A. punctipennis*. No forms suggestive of malarial parasites were encountered. As the result of various tests it was assumed that wintering mosquitos were the predominant ones found until the latter part of April. To determine the malarial indicator it is necessary to dissect a large number of insect carriers within a very restricted area. With this purpose in view, mosquitos were collected from negro cabins on plantations where the highest malarial index had been noted and finally a more intensive plan was pursued: a group of eight cabins was selected in which gamete bearers had been discovered the previous autumn. A second blood examination, taken just prior to the mosquito dissections, showed that at least six of the inhabitants still harboured gametes. The six cabins yielded large numbers of *Anopheles* daily, beginning 9th May; a moderate number were taken on or near the beds of the infected persons. More than 1,100 *Anopheles* were taken from the six cabins and examined during a period of 20 days. No parasites were seen until 15th May, when two *A. quadrimaculatus* were found infected. From the therapeutic standpoint, at any time previous to 15th May, in the locality investigated, protection from malaria may be secured by treating with quinine all the human carriers; the insect carriers are thus prevented from carrying out their rôle in completing the cycle. Failing this, prophylactic measures among healthy and other susceptible persons may be instituted at any time from 15th May to 1st June, when the completion of the mosquito-cycle in this locality makes preventive measures urgent.

Galewsky (—). **Vorschläge zur Entlausung von Gefangenenlagern.** [Suggestions for freeing war prisoners' camps from lice.]—*Deutsche Medizinische Wochenschr., Berlin,* xli, no. 22, 27th May 1915, pp. 652–653.

This paper describes experiments carried out in a prisoners' camp at Königsbruck with the object of ascertaining the cheapest and most effective way of destroying lice in clothing and buildings. A building used by Russian prisoners, nearly all of whom were infested with lice, was selected for the first experiment. All cracks and corners were washed with a 3 per cent. solution of cresol soap and were then filled up. In this building, with a floor space of 450 square metres, 25 kilos of sulphur were burnt in 16 sulphur stoves made on the principle of the Bunsen burner and costing £15 only for the whole 16. The men's clothing was hung up loosely, except in the case of two bundles of shirts, which were tied up tightly. The burning was rapid, reaching its maximum in 45 minutes. After a 3-hours interval, the doors and windows were opened and two hours later the prisoners, who had had a bath in the meantime, reoccupied it. Except in the two tightly packed parcels, the lice and their eggs had been killed everywhere. Sulphur fumes seem therefore to be effective against lice.

Charleman (E.). **Къ вопросу о пищѣ стрекозъ.** [On the question of the food of dragon-flies.]—**«Любитель Природы.»** [*Friend of Nature*], *Petrograd,* no. 1, January 1915, pp. 14–15.

During the large migrations of dragonflies (*Libellula quadrimaculata,* L.), which took place in the spring and summer 1914, they destroyed many harmful insects, such as Simuliidae, *Anopheles,* various small Lepidoptera and Anthomyid flies.

NEZLOBINSKY (N.). **Къ вопросу объ уничтоженіи стрекозами мошекъ и комаровъ.** [On the question of the destruction by dragonflies of gnats and mosquitos.] **«Любитель Природы.»** [*Friend of Nature*], *Petrograd*, no, 4, April 1915, pp. 110–114.

The author, referring to the foregoing paper, observed in 1911 on the lower reaches of the Dnieper, that dragonflies resembling *Libellula pectoralis*, destroyed in three or four days all the mosquitos in that locality. In spite of this, he does not consider that dragonflies can be a serious factor in controlling mosquitos, except on the rare occasions when they are present in abnormal numbers.

THEOBALD (F. V.). **Report on Economic Zoology for the year ending September 30th 1913.** *Jl. of the South Eastern Agric. Coll. Wye, Kent*, no. 22, 1913, pp. 334–339.

Large numbers of *Pyrellia lasiophthalma*, Macq., *Pollenia rudis*, F., and *Chloropisca circumdata*, Meig., were sent from widely separated localities in England, where they were swarming in houses in September and October. These flies are difficult to destroy; pyrethrum and tobacco fumes gave unsatisfactory results and more drastic measures cannot usually be employed on account of possible damage to furniture and fittings. In this case, they were swept off the ceilings into cloths and burnt. *Pyrellia lasiophthalma* has not previously been recorded as a house pest, but in the cases in question was as common as *Pollenia*.

Poultry are said to be not infrequently attacked by the bug, *Cimex columbaria*, on the Continent, but the author has only once seen the insect in Britain previous to 1913, and then in very small numbers on pigeons. According to Raillet, sitting hens are often driven from their eggs by this bug. From observation of specimens in captivity, it was found that they attack man as well as birds. Fumigation with sulphur is suggested as the simplest means of destroying them in poultry houses.

FROGGATT (W. W.). **Sheep-Maggot Flies.**—*Dept. Agric., New South Wales, Sydney*, Farmers' Bulletin no. 95, March 1915, 52 pp., 5 figs., 4 plates.

Much of the matter in this paper has already been abstracted [see this *Review*, Ser. B, i, p. 225; ii, pp. 85, 94; iii, pp. 13–17.] As the flies which infest the live wool of sheep develop in the first instance in decaying animal and vegetable substances, preventive measures must include the destruction by poisoning or burning of all matter in which they can breed. An efficient poison can be made by dissolving 1 lb. arsenic in 5 gals. water. When once the sheep are blown, the larvae under the wool can only be destroyed by shearing off the infested wool and treating with some mixture to kill the larvae thus exposed. Attempts to find some mixture or essential oil which will attract the flies away from the sheep, have up to the present been unsuccessful. The question of inoculation of sheep to render them immune to attack has been raised and the statement has been made that all sheep which become blown are in an unhealthy condition. This is not borne out by field observations.

Anastellorhina augur, F. (*Calliphora oceaniae*), (smaller yellow house blow-fly), occurs in all kinds of situations; 14 days intervene between the egg and the appearance of the adult. The larva becomes mature on the 7th day after hatching, then drops from the wool into the soil to pupate. At Yarrawin, no specimens were reared from stained wool until April. From then onwards throughout the winter, this species was common. The larval stage was longer during winter by one or two weeks, and the pupal stage lasted from four to six weeks. *Pollenia stygia*, F. (*C. villosa*), (golden-haired blow-fly) has an extended range over the greater part of Australia. The life-history is similar to that of the previous species. *Neocalliphora ochracea* is found in the forest country near Walcha about midsummer. The life-history is unknown. *Pycnosoma* (*Calliphora*) *rufifacies* (hairy maggot-fly) was very abundant at Yarrawin, attacking sheep from the end of September to November, although carrion was infested throughout the year. *Pycnosoma* (*C.*) *varipes* is common in the western districts of New South Wales and Queensland; this species breeds in carrion and has been reared from soiled wool. *Lucilia tasmaniensis* has a wide range in Australia. Nothing is known of the larval and pupal habits, but this is probably the species which infests sheep at Tanna, in the New Hebrides. *Stomoxys calcitrans* was present in large numbers at Yarrawin. *Ophyra nigra* occurs in Australia, the Malay Archipelago and China. The adults feed on and oviposit in both animal and vegetable matter. Living wool is frequently infested by this species. The most important result of the Yarrawin investigations was the discovery of the Chalcid, *Nasonia brevicornis*, parasitic on blow-flies, and colonies of it have been liberated in infested localities. Other enemies of blow-flies are the ant, *Iridomyrmex detectus*, nocturnal spiders, carnivorous beetles, especially the Staphylinid, *Creophilus erythrocephalus*, a wasp, *Gorytes* sp., besides birds, including crows, magpies and starlings. In addition to the testing of washing and dipping fluids and the use of poisoned baits, a biological survey of the Brewarrina district was made. Attempts to find flies sheltering in hollow trees, rabbit burrows, etc., at any period of the year, were unsuccessful.

URICH (F. W.). **A Preliminary List of the Mosquitos of British Guiana.**—*Jl. Bd. Agric. Brit. Guiana, Georgetown*, viii, no. 3, July 1915, pp. 80–85.

This list contains the names of 40 species of mosquitos found in British Guiana, with the range of distribution given in each case. The list was compiled in 1911 and, as an editorial note points out, there are many additional species now known from that country.

GRAHAM (W. A.). **Agricultural Achievements and Problems in North Carolina.**—*Bull. North Carolina Dept. Agric., Raleigh*, xxxvi, no. 7, July 1915, 27 pp.

The work of tick eradication in North Carolina has been carried on successfully. In 1902, the quarantine line was along the crest of the Blue Ridge Mountains. By January 1915, the State had been cleared of the tick [*Margaropus annulatus*] from its western boundary to the

Roanoke River, only 22 out of the 100 counties remaining in quarantine. The work was greatly assisted by the law being adopted in advance by many eastern counties, and few ticks are found where it prevails.

BAKER (A. W.). **Lice affecting the Domestic Fowl.**—*Canadian Entomologist, London, Ont.*, xlvii, no. 8, August 1915, pp. 237–241, 1 plate.

The following species of lice infest domestic fowls in Canada: *Menopon pallidum*, Nitzsch (common hen louse), *M. biseriatum*, Piaget, *Lipeurus variabilis*, Nitzsch (variable chicken louse), and *Goniocotes hologaster*, Nitzsch (lesser chicken louse). The most effective lice powder can be made by adding sufficient plaster of Paris to three parts gasoline and one part crude carbolic acid; two or three dustings of this powder at intervals of five to seven days are recommended. Blue ointment worked into the feathers in small quantities has proved successful. Baths containing a mixture of road dust and tobacco dust should be kept in every run. It is advisable where brood hens are used, to set them on tobacco stems obtainable from any cigar factory. Carbolised sweet oil may be used in extreme cases of infestation of young chicks, but must be applied sparingly. Before the introduction of young pullets, the house should be cleaned and painted or sprayed with a mixture of three parts kerosene and one part crude carbolic acid (95 per cent.).

L'agriculture et l'élevage au Marungu. [Agriculture and stock breeding in the Marungu region.]—*Bull. Agric. Congo Belge, London*, v, no. 3, September 1914, pp. 457–470, 5 figs., 1 sketch map. [Received 11th September 1915.]

M. Bovone, the author of the monograph of which this paper is an abstract, has not met with *Glossina morsitans* in the Marungu region, west of Lake Tanganyika. Elevated, dry and bare plateaus are not a favourite habitat of the fly, which is, however, found in the territories adjoining Marungu. To the north, fly is found at Mulonde and along the road to Baudoinville; to the south-west it occurs on the banks of the Lukifwa. Cattle driven along the road from Mulonde to Mutambala, a distance of nearly 10 miles, are occasionally followed by tsetse-flies, though up to the present, no cases of infection have been reported.

VERMEESCH (M.). **Les vallées de la Dikuluwe et de ses affluents au point de vue de leur valeur agricole.** [The valleys of the Djkulwe and its tributaries from the point of view of their agricultural value.] —*Bull. Agric. Congo Belge, London*, v, no. 3, September 1914, pp. 516–528, 1 sketch map. [Received 11th September 1915.]

The author was instructed to examine the valleys of the Dikulwe and its tributaries in Katanga, Belgian Congo, with a view to determining areas suitable for farming. A sketch map shows that *Glossina morsitans* occupies the whole basin except the higher reaches of some of the tributaries. Fly is very abundant to the north of this region, game being plentiful there. It is asserted that regions from which fly is absent are also poor in game, and that when game is abundant along a stream, *G. morsitans* is also more abundant. The author expresses the view that cattle can only be utilised for agricultural purposes if the game is either destroyed or driven back. In an editorial foot-note this remark is considered to be too sweeping.

G. palpalis was met with at various points. On the Dikulwe and Lufira rivers and some of their tributaries, where good farm land exists in an infested area, the complete clearing of the banks will dispose of the fly. This could be easily done in this region, as the width of the belt of bush is only 3 or 4 yards and it is not continuous.

van Saceghem (M. R.). **Travaux du Laboratoire de Bactériologie vétérinaire de Zambi, Bas Congo. III. Etude sur la Dermatose contagieuse (Impétigo contagieux).** [Work of the laboratory of veterinary bacteriology at Zambi, Lower Congo. III. A study of contagious dermatosis.]—*Bull. Agric. Congo Belge, London*, v, no. 4, December 1914, pp. 567–573, 3, figs. [Received 15th October 1915.]

Contagious dermatosis has often been confounded with many skin affections, so common in hot countries, which has resulted in great confusion in the descriptions of the disease by various observers. Dermatosis has been attributed to an acariasis, particularly to demodectic mange. The co-existence of two distinct diseases on one and the same animal is the cause of this confusion. These are caused by *Demodex folliculorum* var. *bovis* and the fungus, *Dermatophylus congolense*, respectively.

MacGregor (M. E.). **Notes on the Rearing of *Stegomyia fasciata* in London.**—*Jl. Trop. Med. Hyg., London*, xviii, no. 17, 1st September 1915, pp. 193–196.

In May 1915, the Wellcome Bureau of Scientific Research received through Sir James Kingston Fowler, Chairman of the Yellow Fever Commission, a few dried leaves of the West African cotton-wood tree, on which were eggs of *Stegomyia fasciata* ; these had been sent to the Colonial Office by Mr. A. W. Bacot from Sierra Leone. The leaves had been at least three and a half months in a dried condition. Under the microscope, a fairly large number of eggs were seen to be adhering to them. About 75 per cent. of these were apparently dried up, while the rest appeared normal. The leaves were cut up into pieces about 1 in. square and placed on tap-water in glass containers and kept at the temperature of the laboratory. This was done on 29th April at 11.30 a.m., and by 9.30 a.m. the next day the water was crowded with larvae in such numbers as to leave no doubt that the shrivelled eggs, as well as the normal ones, had hatched. This first generation of larvae was divided into approximately equal numbers and placed in separate containers : No. 1 containing tap water contaminated with straws from horse manure and the organic matter and bacteria thereon, No. 2 containing fresh water from the Serpentine in Hyde Park. Under equal conditions of light and temperature, the larvae in container

No. 1 had grown and greatly increased in size four days later, while those in No. 2 had hardly grown and were also more sluggish in their movements. The waters of both containers, together with the respective larvae, were therefore then mixed and more straws from horse manure added. To determine the optimum temperature with the above food supply for rearing the larvae in the laboratory, eight lots of twenty larvae, of as nearly as possible one size, were placed in eight small beakers, together with equal supplies of water from the main container. These beakers were placed on a sheet of copper, heated by a small Bunsen flame at one end, at varying distances from the heated end. On the temperature of the water becoming constant, it was found to vary between 16° C. and 41° C. according to the position of the beakers. In beaker No. 4 (25·9° C.), the larvae seemed to do best and the mosquitos bred from this beaker were certainly the largest and strongest specimens. In beaker No. 3 (23·8° C.), the imagines, when they emerged, were perhaps equally fine specimens, but took, on an average, three days longer to complete their metamorphosis. At temperatures below this the metamorphosis was considerably prolonged, while at higher temperatures the average date of emergence was considerably advanced. With the food supply and light conditions used, the optimum temperature was from 23° to 26° C., the average larval period being 10 days, and the average pupal period, 6. On emergence, the mosquitos were placed in cages made of a wooden box with top and bottom removed and screened with butter muslin. Mating took place almost as soon as the insects were able to fly. A guineapig furnished the food-supply for the adult females, a black one being chosen on account of the mosquitos' preference for that colour. On one occasion a white guineapig was substituted, but the mosquitos could not be induced to attack it at all readily. Before their first meal, the mosquitos did not attack in the voracious manner they adopted at subsequent meals. Under laboratory conditions the males live from ten days to three weeks, while the females live from a month to six weeks, some even being alive after two and a half months. A sixth generation has now been produced without loss of size or vitality.

The author also records the finding of *Culex pipiens* in enormous numbers in a sump 120 feet below ground at the Highgate Station of the Underground Railway. A list of eleven works dealing with mosquito life-histories is given.

STEVENSON (A. C.) & WENYON (C. M.). **Note on the Occurrence of *Lankesteria culicis* in West Africa.**—*Jl. Trop. Med. & Hygiene, London*, xviii, no. 17, 1st September 1915, p. 196.

The occurrence of *Lankesteria culicis*, Ross, in *Stegomyia fasciata* obtained from Sierra Leone is of great interest. *L. culicis* has now been recorded from India, South America, Baghdad and West Africa. The Gregarine sporocysts must have been submitted to the same amount of dessication as the mosquito eggs, and the larvae, hatching from the eggs, became infested by ingesting these sporocysts. The gregarine infection has passed through several generations of mosquitos bred in this country.

NUTTALL (G. H. F.) & HINDLE (E.). **Experiments in the "Tryposafrol" Treatment of Trypanosomiasis (*T. brucei*) in Guineapigs and of Piroplasmosis in Dogs.**—*Parasitology, London*, viii, no. 2, September 1915, pp. 218–228.

In 1912, Brieger and Krause reported upon experiments with a dye named tryposafrol, which was stated to have cured nagana in rats and guineapigs. Four laboratory strains of *T. brucei* were used in the investigations. The animals were treated immediately after inoculation or after the lapse of 1 or 2 days, the dye being given every other day in quantities of 0·05 to 0·1 grm. mixed with the food. The experiments have been repeated by other investigators, but always with negative results. In the experiments carried out by the authors, all guineapigs infected with *T. brucei* (strain "ferox") died whether treated with tryposafrol or not. Both tryposafrol and novo-tryposafrol exerted a directly injurious effect upon the guineapigs. The treated guineapigs died from 5 to 33 days after inoculation, those untreated from 23 to 45 days later. Of five dogs infected with *Piroplasma canis* (Cambridge strain), 4 were treated and 1 not treated with novo-tryposafrol. All the dogs died, although treatment was given under the most favourable conditions, starting on the day of inoculation. The drug exerted no influence upon the course of the disease, nor upon the appearance of the parasites and their progressive increase in the blood. Judging from the results on the dogs, novo-tryposafrol will prove equally useless in the treatment of bovine piroplasmosis.

CARTER (H. R.). **Memoranda from Malarial Surveys and Demonstration Work.**—*Southern Med. Jl., Birmingham, Ala.*, viii, no. 9, September 1915, pp. 750–753.

At Electric Mills, Miss., a sawmill village, the ground was impervious to water and its surface was flat. When one road to the sawmill became full of holes and ruts it was abandoned and another made close by. Breeding places for *Anopheles* were thus abundant. Filling these with earth was unsatisfactory and expensive. Filling with sawdust and bark trash was advised, and as these materials were abundant, they were found much cheaper and also more effective for the purpose.

BROOKE (G. E.). **Contact Insecticides.**—*Lancet, London*, clxxxix, no. 4801, 4th September 1915, p. 571.

The following contact insecticide was devised by the author, Port Health Officer at Singapore, and is strongly recommended; the stock solution forms an immediate, stable and non-inflammable emulsion on the addition of water:—Stock solution: Carbon bisulphide 1, kerosene 20, mixed first by shaking; then add Sanitas-Sypol 7, and keep in a stoppered bottle. For use: Make a 10 per cent. solution in water, adding the water to the stock and not the stock to the water. This solution is a milk-white emulsion, practically permanent when corked, but losing its insecticidal power with time, so that it should always be prepared just before use. Using a sprayer giving a fine but strong spray, bugs appear to be killed within a second or two. Two applications killed all the lice (over 2,000), and their eggs, on a young puppy, while the Government veterinary surgeon at Singapore reports that it is the only agent he has used which is capable of dealing instantaneously with cattle ticks.

Horn (A. E.). **Colony of the Gambia. Annual Medical and Sanitary Report for the year ending 31st December 1914,** *Bathurst,* 40 pp.

The mosquito index figures for Bathurst are defective owing to shortage of staff, but for June and October the figures were 53 and 64 per cent. respectively, more thorough examination of houses accounting for the higher figures. Of the water specimens taken, 1,036 were found infected, 237 from wells and 799 from jars and bottles; these yielded 729 *Stegomyia,* 53 *Culex* and 17 mixed *Culex* and *Stegomyia.* Land-crab holes swarm in the north-west of the town and, when disturbed, several mosquitos emerge from practically every one of them. Filling them in proved useless, as the crabs quickly form others; filling with chloride of lime and treading it down was more effective. A salt-water lagoon to the north of the town was found to be swarming with larvae of *Culex thalassius.* About 12 acres of mangroves have been cut and cleared to the north-west of the town. When a well is found to contain mosquito larvae, an order is served on the owner to stock it with fish; the fish are generally asked for and obtained from the Board of Health stock, which has the advantage of enabling a record of the well to be kept.

Addison (J. B.). **Ann. Rept. Med. Dept for the year 1914,** *Victoria, Seychelles,* 1915, 13 pp.

The chief Medical Officer reports that some of the outlying islands are still infested with chiggers [*Dermatophilus penetrans*], and in spite of precautions, a few cases appear in Mahe from time to time. There does not seem to be, however, any fear of a serious infestation.

Saunders (P. T.). **Skin Disease of Cattle in Antigua.**—*West Indian Bulletin, Barbados,* xv, no. 1, 1915, pp. 36–46.

A disease of cattle in Antigua, supposed to be identical with the "farcin du boeuf" of Guadeloupe, is said to have been common in France fifty years ago, but to have now disappeared. There is some doubt as to whether the Antigua and Guadeloupe forms are identical, as in the former island only bovines are affected, and in the latter horses, cattle and mules. In the British West Indies it is at present only known in Antigua and there chiefly in the south-western portions of the island. Cattle trade between Antigua and Guadeloupe was active forty or fifty years ago and there is a general belief that the disease made its appearance coincidently with the importation of cattle from Senegal about that time. The gold tick, *Amblyomma variegatum,* F., is supposed to have been brought by them to the island. The precise cause of the disease is still unknown, but inasmuch as it is rare or unknown on estates where spraying against ticks is carefully carried out, it seems reasonable to connect the tick with its carriage. The symptoms, pathology and treatment are described at length. The mortality formerly reached from 75 to 80 per cent., but is now about 25 per cent.

Brünnich (J. C.). **A new dipping fluid.**—*Queensland Agric. Jl., Brisbane*, iii, no. 4, April 1915, pp. 161–163. [Received 25th September 1915.]

Tar and soap are much the most costly ingredients of arsenical dip mixtures and this fact is believed to have led to the diminution of the recommended proportions by some manufacturers of concentrates. Their cost, and particularly the difficulty now experienced in obtaining Stockholm tar of good quality, determined the author to experiment with commercial bone-oil as a substitute. Bone-oil is a by-product in the manufacture of animal charcoal, and procurable in sufficient quantities from the sugar refineries in Australia. Experiments showed it to be in the main readily emulsifiable by boiling with alkali, and the resulting solution possessed marked detergent properties, and retained these, in common with Stockholm tar, when compounded with hard water. It was therefore expected that arsenical solutions of standard strength containing bone-oil would prove fully effective in tick destruction, and trials with a dip containing ¼ per cent. of bone-oil supported this. On the seventh day after spraying, the cattle were clean and showed no indications of scalding. Most of the ticks were dead on the third day. The trials proved the complete efficacy of the bone-oil arsenical dip, and also that bone-oil has a decidedly beneficial and emollient effect. The strong, though not objectionable, odour imparted by the oil, leaves dipped animals within 24 to 48 hours and did not communicate a noticeable odour or taint to the milk produced. The cost of the chemicals in the bone-oil dip is only about half of those in the old standard dip and the process of manufacture is much simplified, the concentrate being rapidly and easily prepared as follows: The required amount of bone-oil (at the rate of 1 gal. to 400 gals. of dipping fluid) is heated in an open pan with one-quarter of its weight of caustic soda and stirred. After a quarter of an hour, the mass being still in condition of active frothing, the flame is withdrawn and the arsenic, previously intimately mixed in the dry powder form with a quarter of its weight of caustic soda, is stirred into the oil in small portions. On partial cooling, the mass receives the addition of sufficient water to form a soft homogeneous paste, which can be immediately dissolved in more water to produce the dipping fluid ready for use, or can be tinned as a concentrate. To make 400 gals. of dip, the proportions of constituents recommended are :—Arsenic, 8 lb. to 8½ lb., according to quality ; bone-oil, 1 gal. (from 9 to 9½ lb.) ; caustic soda, 4 lb. As a mean of several laboratory trials, the following figures may be taken as a guide in preparation of concentrate on a large scale :—Bone oil, 95 parts by weight ; caustic soda, 25 parts ; arsenic, 100 parts ; and caustic soda, 25 parts. This gives a total of 245 parts, which after boiling and cooling, were reduced to 200 parts, so that 50 parts of water were added to make 250 parts of paste. For final fluids the latter is diluted in the proportion of 1 part concentrate to 200 parts of water. The paste form is recommended, as pastes possess the following advantages over fluids: perfect homogeneity, allowing the amount of arsenic to be accurately gauged ; no liability to exude from the containers, which are therefore less expensive to construct ; generally greater concentration and consequent saving of freight.

Mosquito-borne Diseases in the Gilbert and Ellice Islands Protectorate. Reports to the Colonial Office. [Received 14th September 1915.]

The Senior Medical Officer of the Protectorate, Dr. B. C. N. O'Reilly, reports that on a superficial examination of these islands, no species of *Anopheles* have been found. Species of *Stegomyia* are, however, abundant and generally distributed. In the Gilbert Islands, there seem to be no endemic mosquito-borne diseases, whereas in the Ellice group numerous cases of elephantiasis are to be found on every island. As the conditions in the Gilbert Islands are everywhere favourable to the establishment and spread of this terrible disease, it is urged that immediate steps should be taken to prevent its introduction, and the Medical Officer of the Ellice Islands recommends that no person should be permitted to travel to or from the Ellice group without a medical certificate that he or she is free from microfilaria. The Resident Commissioner of the Protectorate states that there can be no doubt that elephantiasis was brought into the Ellice Islands as a result of the introduction of native pastors and teachers from Samoa. The London Missionary Society is now beginning to send Samoan pastors to the Southern Gilbert group, and it is pointed out that unless the landing of Samoan and Ellice natives in the Gilberts is immediately controlled, there is serious danger that it may soon prove too late to prevent the establishment of elephantiasis in these islands.

COOK (F. C.), HUTCHISON (R. H.) & SCALES (F. M.). **Further Experiments in the Destruction of Fly Larvae in Horse Manure.**—*U. S. Dept. Agric., Washington, D.C.*, Bull. no. 245, July 20th 1915, 22 pp.

This is a continuation of work on the same subject by these authors [see this *Review*, Ser. B, ii, pp. 178–179.] The general plan was the same, but a few experiments were also made in concrete pits. In the previous series the best results were obtained by applying the borax in solution daily, but it was thought desirable to advise a restriction of the amount of borax-treated manure to not more than 15 tons to the acre, as the effect of borax on crops is not yet sufficiently known. The following chemicals were used and the apparent larvicidal effect of each is indicated by the figure which signifies the percentage of the control average. Arsenical dip full strength, 87; with an equal volume of water, 89; with 3 volumes of water, 74; pyridine 1 per cent., 99; para-dichlorobenzene, ½ lb. in 10 (U.S.) gallons water, 93 and 50; double this strength, 97 and 98. The effect on the percentage of water-soluble nitrogen was apparently negligible in all cases. Chloride of lime at ¾ lb., 1½ lb. and 3 lb. to each 8 bushels of manure with 10 (U.S.) gallons water was tried; the results were negative, the damage to the manure obvious and the cost prohibitive. Epsom salts and lime-sulphur had no apparent larvicidal effect; sulphuric acid at 1, 2 and 3 per cent. had practically no larvicidal action, but at 3 per cent., the total nitrogen of the manure was increased to three or four times that of the control. Aniline was next tried, 1 in 50 gave 98 per cent. larvicidal action; 1 in 100, 97; 1 in 20, 80 and in a second case 99. Nitrobenzene, 1·67 lb. with 1/3 lb. fish oil in 10 (U.S.) gals. of water, gave 99 and 100; the same mixture diluted with an equal volume of water, 99. In a series of experiments in the open, the following results were obtained:—Ground hellebore, ½ lb. in 10 gals. of water, 59 and 62; ¼ lb. in 10 gals., 45 and 27; ⅜ lb. in 10 gals., 31 and 42; ¼ lb. in 10 gals., 16 and 49; aniline 1 in 200, 85; nitrobenzene mixture, 89 and 81; pyridine 1 in 1,500, 8·3 and 47·6; in another series of hellebore trials figures from 88·3 to 91·3 were obtained. Cresylic acid and β-naphthol had no larvicidal effect in cage experiments; para-dichlorobenzene about 16 per cent.; formaldehyde, at 1 to 5, 1 to 8 and 1 to 10 dilutions of the commercial 40 per cent. solution, only showed effect at 1 to 6 and then only 17 per cent.; its cost puts its use out of the question. In the nitrobenzene experiments the quantity of fish-oil soap seemed to be important, the mixture containing the largest quantity having the greatest effect. Oxalic acid, 1 lb. and 2 lb. in 10 (U.S.) gals. of water, had no effect. The variation of the effect of pyridine between cage and open pile experiments cannot be explained; the cost is too high and the disagreeable odour and toxicity of the substance make it objectionable. The use of plants containing saponin was suggested to the authors by Dr. Alsberg and the following were tried:—Corn cockle (*Agrostemma githago*); wheat screenings containing about 43 per cent. of corn cockle were used; the results were variable, sometimes nil, sometimes 49 per cent.; roots of *Agave lecheguilla*, 2½ lb. in 10 gals. of water, gave 82 and 84 per cent. "Black Leaf 40" showed no larvicidal action. Ground seeds of larkspur (*Delphinium*), 1 lb. in 10 gallons with 1 per cent. sulphuric acid and allowed to extract for 12 hours, gave figures varying from 57 to 90 per cent. Stramonium extract was not satisfactory. Powdered hellebore proved the most efficient and practical of all the substances tested, but as this is an actively poisonous substance and farm poultry and animals peck at or consume manure, tests were made with chickens for several weeks, freshly treated manure being given every three days; no ill effects were observed. The comparative advantages of borax and hellebore are summarised as follows: borax, which was shown in Bulletin No. 118 to be an effective larvicide, is obtainable in all parts of the country, and the cost of treating manure at the rate of 0·62 pound of borax per 8 bushels is 0·42 cents per bushel. Powdered hellebore, using one-half pound to 10 gals. of water and applying this to 8 bushels of manure, is also an effective larvicide and exerts no injurious action on the fertilising value of the manure, as determined by bacteriological and chemical analyses, and no injurious action on plants has been detected in any of the field tests. Hellebore is used as an insecticide and is obtainable in most cities and agricultural districts. The cost of this treatment is 0·69 cents per bushel of manure. While borax may be applied to manure at the foregoing rate and the treated manure may be added to the soil at the rate of 15 tons to the acre without injuring vegetation, excessive quantities may be used through carelessness, and injury to vegetation may result. In the light of this year's experiments it seems advisable to recommend borax as a larvicide for the treatment of outhouses, refuse piles, and all other places where flies may deposit eggs. On account, however, of the possible results of carelessness, and as large quantities of manure are sometimes used by market gardeners, it seems best to guard against possible injury to vegetation by recommending powdered hellebore, since no injury can arise from the use of excessive quantities, as it is entirely decomposed in the course of the fermentation of the manure.

Townsend (C. H. T.). **On the Reproductive and Host Habits of** *Cuterebra* **and** *Dermatobia.—Science, Philadelphia,* xlii, no. 1077, 20th August 1915, pp. 253–255.

Cuterebra belongs to the same group of flies as *Dermatobia hominis*, the eggs of which are now believed to be carried by blood-sucking mosquitos of the genus *Janthinosoma.* A female of *Cuterebra cuniculi* was found on a plant growing in a moist situation at Beltsville, Maryland, on 25th June 1915. The fly was inactive and had probably recently emerged. It was kept alive until 2nd July, when it was killed and dissected. The presence of an incubating uterus indicated that the egg undergoes development up to the young larval stage within the parent. In the case of *Cuterebra*, the larvae almost certainly reach the host by accident. The eggs are probably deposited in the burrows of rabbits or other small mammals parasitised by this species. Adults have been found in considerable numbers in the south-western mountain regions of North America, almost invariably near running water. *Dermatobia* does not reach its host by the same means as *Cuterebra.* The carriage of *Dermatobia* eggs by *Janthinosoma* has been recorded from Trinidad and Venezuela. It may be supposed that *Dermatobia* has a reproductive system and egg similar to that of *Cuterebra.* Several distinct species of blood-sucking Diptera may be employed by the fly for carrying its eggs ; species of *Chrysops* have been suggested in this connection. It is certain that oviposition on foliage does not occur and the fly probably captures the elected carrier and holds it, while gluing the eggs firmly to the underside of its body in such a position that it will come into immediate contact with the skin of any animal bitten by the carrier.

Lutz (A.). **Sobre a sistematica dos tabanideos, sub-familia Tabaninae.** [On the systematics of the Tabanidae, sub-family Tabaninae.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro,* vi, no. 3, 1914, pp. 163-168. [Received 10th August 1915.]

This is a key to the genera of the sub-family Tabaninae, in Brazil.

Neiva (A.). **Informações sobre o berne.** [Notes on "Berne."]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro,* vi, no. 3, 1914, pp. 206–210, 2 plates. [Received 10th August 1915.]

Real knowledge of *Dermatobia hominis* has been greatly interfered with by the credence given to popular accounts of its life-history, which are often very erroneous. In Brazil nearly all species of Tipulidae, *Volucella obesa* and a species of *Mesembrinella* are accused of producing the warbles ; in Mexico, the Lymexylonid beetle, *Atractocerus brasiliensis*, and in Matto Grosso, several species of the genus *Echinomyia* are suspected. Recently in Minas Geraes, Lutz has found *Anthomyia heydenii*, Wied., carrying ova greatly resembling those figured by Surcouf, but these were proved not to be eggs of *Dermatobia.* In the course of five years study of the subject, many flies have been captured on cattle and horses, but in no case has penetration of the skin by the larva been observed. Dissection of adult females shows that the eggs are probably laid in batches at intervals as they mature. The belief current in Brazil that the fly lays its eggs on leaves is considered erroneous. It has been stated that *Dermatobia* will oviposit on clothing and this may explain cases in newly born children who have never left the house; such cases are however rare. Young children may be expected to suffer more than adults, as they are more constantly at home and are less able to defend themselves against the species of *Janthinosoma* which are common in houses. Women contract "berne" far less than men, and dogs suffer much more than cats, the conclusion being that it is only in places frequented by adult *Dermatobia* that "berne" can be acquired. Generally speaking the evidence of carriage of the eggs by *Janthinosoma* or any other fly requires to be considerably strengthened before it can be accepted, and the identity of the eggs and larvae described by Surcouf with those of unquestionable *Dermatobia* larvae must be carefully confirmed or otherwise. The author believes that mistakes have been made.

PORTCHINSKY (L.). **Слѣпни и простѣйшіе способы ихъ уничтоженія.** [Tabanidae and the simplest methods of destroying them.] **«Труды Бюро по Энтомологіи Учен. Комит. Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture.*] Sixth, enlarged edition. *Petrograd*, vol. ii, no. 8, 1915, 58 pp., 21 figs.

A general account of the TABANIDAE and of their importance as carriers of diseases, such as anthrax, trypanosomiasis, filariasis, etc., is given. Over 100 species are known to exist in Russia, including about 60 species of *Tabanus*, 18 *Chrysops*, 6 *Haematopota*, the remainder being made up of representatives of the genera *Nemorius*, *Sylvius*, *Hexatoma* and *Pangonia*. They are found over the whole of Russia; in the polar regions in the north the number of species is limited, but those which occur there are frequently present in enormous numbers. Some of the species found in the North of Russia are *Tabanus tarandinus*, which is a serious scourge of reindeer, *T. montanus*, *T. tropicus*, *T. luridus*, *T. bromius*, *T. maculicornis* and *Chrysops coecutiens*. Water and plantations of trees are indispensable conditions for the existence and breeding of these pests. The larvae of *Tabanus* are very voracious and are known to destroy larvae of *Rhizotrogus*, *Omaloplia* and caterpillars of *Agrotis*. Amongst the enemies of TABANIDAE is *Bembex rostrata*; this species is, however, local and is in turn attacked by various parasites, such as *Miltogramma*, *Parnopes* and *Chrysis*. The eggs of *Tabanus* are destroyed by *Telenomus tabani*, Mayr, and *Telenomus* (*Phanurus*) *tabanivorus*, Ashm. The only effective dressing for protecting stock from these flies, appears to be train-oil. These insects have a habit of concentrating in damp places and near pools at which they drink; this is done on the wing by skimming the surface and taking up water with their proboscis; owing to their rapid and strong flight, only a portion of the lower side of the body comes in contact with the water. This drinking takes place chiefly during the heat of the day, but a number of insects, mostly females, were observed to come to such pools after 3 or 4 p.m. The author therefore recommends pouring some liquid on the surface of the pools, which would cling to the underside of the body at the moment when it comes in contact with the water. Very good results were obtained by the use of kerosene ; on the third day after the kerosene has been applied, the whole pool was covered with bodies of dead insects, while those which managed to escape from the pool perished, owing to the kerosene adhering to their bodies and thus poisoning or suffocating them. The kerosene must form a coating over the whole surface of the pool and must be renewed from time to time, if possible, daily. These trap pools are very effective means of destroying the flies and every pool which attracts the insects should be thus treated. Only pools of stagnant water can be utilised for this purpose ; they may be artificially constructed and even troughs or any wide-mouthed vessels filled with water and kerosene can be successfully used. Mazute (naphtha residues) proved even more effective than kerosene, owing to it being cheaper and thicker and thus remaining longer on the water and trapping more effectively. Only individuals of the genera *Tabanus* and *Chrysops* were trapped in these pools ; *Haematopota* do not need water and cannot be destroyed by this means. The following species were found in the pools : *Tabanus bovinus*, *T. montanus*, *T. tropicus*, *T. luridus*, *T. solstitialis*, *T. borealis*, *T. maculicornis*, *Chrysops relictus* and *C. coecutiens*. During five days in one trap pool, of an area of one square metre, in a moderately infested locality, 916 males and 186 females of *T. montanus*, 344 males and 72 females of *T. maculicornis*, and 416 males and 33 females of *Chrysops* were captured. The flies appear to need water during the whole of their life and visit the pools whether they have just sucked blood or not. It is suggested that such trap pools should be constructed in pastures for cattle, etc., but always securely fenced against them. *Haematopota pluvialis* is the commonest species of the genus in North Russia. These insects are less active and avoid open spaces, which is attributed to the number of enemies which prey upon them, such as various dragon flies (*Libellula*, and especially *Aeschna*). They are attracted by black surfaces and avoid white ones. When dressed in white, the author was always less subject to their attacks, as are also white animals. To reduce their number the use of a black shield, covered with some sticky material and carried on a stick along paths which the flies frequent, is advised ; the men who carry the shield should be dressed in white. The author thinks that, with this remedy, it is possible to destroy all the flies in a given locality ; in one of his experiments, when he used this shield over a distance of about 400 yards along the outskirts of a wood, he captured 283 individuals ; this number dropped the next day to 90 at noon and to 28 in the afternoon. Besides all the females of *Haematapota* thus destroyed, a large number of other flies, such as *Hydrotaea meteorica*, etc., were also caught. The lid or bottom of a large basket, painted black, makes the best shield. Cardboard, lined with blue paper, may be substituted. The shields may also be used to protect animals directly, by being fixed to the yokes of oxen, etc. The adhesive substance used, consisted of equal quantities of castor oil and resin, heated on a fire.

Hetsch (H.). **Сибирская язва.** [Siberian sore.] **«Практическая Медицина.»** [*Practical Medicine*], no. 1, 1915, p. 26. (Taken from—**«Вѣстникъ Русской Прикладной Энтомологiи»**, by permission of the Editors.) [*Messenger of Russian applied Entomology*], *Kiev*, ii, no. 1, 1915.

It is stated that flies which have taken up bacilli from unburied bodies of animals, that have died of Siberian sore [anthrax], or from the blood of diseased animals, are able to carry the infection for, approximately, two hours and over a distance of not less than $1\frac{3}{4}$ miles. The most dangerous carrier of anthrax is stated to be *Stomoxys calcitrans.*

Sviridov (D.). **Какъ освободить скотные дворы отъ мухъ.** [How to free cattle-yards from flies.]—**«Хуторянинъ.»** [*Chutorianin*], *Poltava*, no. 30–31, 15th August 1915, pp. 675–676.

The use of sticky paper is recommended as the best remedy for freeing cattle-sheds from flies; the adhesive is prepared from 1 part of resin melted over a fire with two parts of rape oil, adding afterwards 1 part of thick turpentine and, after it has cooled, some honey or spirits, and smearing it on sheets of newspaper. Other remedies include:—Whitewashing the walls with milk of lime to which alum is added in the proportion of $2\frac{1}{2}$ lb. for each 3 gallons of lime; painting the windows of the stables blue in summer; covering manure-heaps with earth during the summer; planting walnuts near cattle-yards, as these trees are avoided by flies and mosquitos. In order to protect domestic animals in the open, smearing them with pig-fat boiled with laurel leaves for 5 minutes or with fish oil to which some laurel or clove oil is added, is advised.

Schöppler (H.). **Der Kresolpuder, ein Schutz- und Vertilgungspuder des Ungeziefers im Felde.** [Cresol powder, a preventive and destructive powder for vermin in the field.]—*Münchener Medizinische Wochenschr.*, *Münich*, lxii, no. 33, 17th August 1915, pp. 1137–1138.

As a military surgeon, the author found that 3 per cent. cresol powder (tricresol powder) was markedly successful in combating fleas. The men powdered their skins thickly and then rubbed the powder well in. Their clothes were also treated. This immediately got rid of the plague of fleas and it became possible to remain in much-infested buildings without inconvenience. On one occasion, the staff had to spend the night in a room adjoining a stable, and although the floor swarmed with fleas, the officers were not attacked.

Roubaud (E.). **Production et auto-destruction par le fumier de cheval des mouches domestiques.** [Production and destruction of domestic flies by horse manure.]—*C. R. hebdom. Ac. Sci.*, *Paris*, clxi, no. 11, 13th September 1915, pp. 325–327.

Recent researches carried out on manure from military stables, have led to the following conclusions with regard to the importance of this medium and the conditions of its infestation by flies. Manure not more than 24 hours old produces, during the warm months, an average of 10,000 to 12,000 flies per cubic metre. It is estimated that one horse can produce sufficient manure to give rise, in summer, to from 40,000 to 50,000 flies a month. Fresh manure alone is suitable for breeding; egg-laying takes place in the stable, on the dung impregnated with urine. Fermentation, which sets in after about 24 hours, prevents oviposition. Antiseptic substances and larvicides (borax, solutions of cresyl, ferrous and ferric sulphates), by decreasing the rate of fermentation, can prolong the normal period of oviposition by 1 or 2 days. These substances therefore give a result opposite to the one required by increasing the chances of infestation of the manure. After the 6th day the manure heap no longer contains larvae, since these have migrated to the edges to pupate. Control measures should thus be taken during the 5 days which follow removal from the stable. The heat of fermentation of a manure heap can be used for the destruction of the contained larvae. The larva, submitted in the manure to a temperature of 50° C., and protected from the gases resulting from fermentation, dies in 3 minutes; in direct contact with the gases, it dies in 1 minute at 51° C., and in 4 or 5 seconds at 60° C. If the manure be turned over, larvae which fall into the hot parts of the interior are killed instantly. This practice, if carried out during the first 3 days, would result in the destruction of 90 per cent. of the larvae. The operation is rendered easier if the manure coming from the stable be treated directly with the heat of fermentation of a heap already formed. The fresh manure should be covered by a layer of hot manure about 20 cms. in thickness; the heat is then readily communicated to the fresh material, in which the eggs are killed before they can develop and the fresh material is also protected against further oviposition. This biological method of destroying larvae by heat is equivalent to an accelerated and total heating of fresh manure up to 50° or 60° C., carried out without the expense of any combustible material.

RODHAIN (J.) & BEQUAERT (J.). **Sur quelques Oestrides du Congo (Communication préliminaire).** [On some Oestrids from the Congo (Preliminary Note).]—*Bull. Soc. Path., Exot., Paris,* viii, no. 7, 1915, pp. 452-458.

The authors are preparing a memoir on this subject, but as it will be some time before this is published, they desire to put on record the principal results obtained. The larva and imago of *Rhinoestrus phacochaeri*, sp. n., found in the skull of *Phacochaerus aethiopicus*, Pall., are described. Imagines of *Oestrus aureo-argentatus*, Rodh. and Beq., have been reared from larvae found in *Bubalis lelwel jacksoni*, Thom., and from the same antelope the larva of *Oestrus bertrandi*, sp. n., is described, the adult being still unknown. Other species described are: —the larva and adult of *Gedoelstia paradoxa*, sp. n., also from the same antelope and from *Damaliscus korrigum jimela*, Matsch., larva and adult of *Kirkia ? blanchardi*, Ged. and *K. minuta*, sp. n. The paper concludes with an account of the distinctions between the larvae of the genera concerned.

Bouet (G.) & Roubaud (E.). **Nouvelle observation sur les Cheromyies de l'Afrique Occidentale.** [New observations on the *Choeromyia* of West Africa.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 7, 1915, pp. 462–463.

When the authors visited Upper Gambia in 1912, they only met with *Choeromyia praegrandis*, Aust., and that in very small numbers. Early in 1915 on the same ground, they found all three species which they discovered in the same burrows of *Orycteropus.* In the red sand at the back of a burrow nearly 250 feet long numbers of young larvae were found ; pupae, probably of *C. boueti* and *C. praegrandis* occurred at the entrance. Adults of both these species and also of *C. choerophaga* were found.

Bequaert (J.). **Sur quelques Auchmeromyies du Congo.** [On some *Auchmeromyia* from the Congo.] -*Bull. Soc. Path. Exot, Paris*, viii, no. 7, pp. 459–462.

Auchmeromyia luteola, F. is found all over the Belgian Congo as far above sea-level as human habitations go. The author has taken it at 7,500 feet on the slopes of Ruwenzori. The life-history of *Choeromyia bequaerti*, Roub., is still unknown ; it lives under the same conditions as those described by Roubaud for *C. choerophaga*, Roub., in the burrows of *Phacochoerus aethiopicus*, Pall. The flies were easily caught on the shores of Lake Albert Edward by thrusting a stick into these burrows. Neither living larvae nor pupae have been found ; males predominate largely among the adults. The larger numbers caught enable the author to amplify Roubaud's original description. A specimen of *C. choerophaga*, Roub., caught in the N.E. corner of the Congo region extends the Eastern range of this species considerably.

M. Roubaud adds a note to this paper in which he says that the proportion of males to females in *C. bequaerti*, Roub., varies somewhat with the condition of the burrows ; males are more common in abandoned or rarely used burrows, the females in those which are constantly inhabited and especially where there are young ; defective nutrition of the larvae in his experience leads to a predominance of males.

Bequaert (J.). **Notes sur la dispersion des Glossines au Congo belge.** [Note on the distribution of *Glossina* in the Belgian Congo.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 7, 1915, pp. 463–467.

Glossina palpalis abounds in the mangrove swamps at the mouth of the Congo ; it also occurs at the foot of the rocky cliffs of Landana, even on the sea-shore, and between Luali and Lukula near all the streams across the south-west limit of the forest of Mayumbe. On the Congo itself, a small jumping spider, *Dolomedes* sp., and a *Libellula* were observed to capture and kill *G. palpalis.* The fly is to be found all along the Aruwimi-Ituri river from its mouth at Asoko. Between Penghe and Irumu, following the forest caravan route from west to east, *G. palpalis* was only found at one of all the numerous river crossings, and on a long devious return journey the same observation was made. The season may possibly account for the absence of this fly and further inquiry is very desirable, but it would nevertheless appear that the great eastern forest which stretches under the equator between the Congo-Lualaba and the 28th meridian and more to the north in the upper Ituri as far as the 30th meridian, is far less frequented by *G. palpalis* than the Central Congo forest. Outside the eastern boundary of the forest *G. palpalis* is found in Irumu in strips of forest along the Shari and in great abundance along the Semliki and its tributaries with forest on the banks. The elevated plateau of Walendu between Irumu and Lake Albert is free from fly. *G. palpalis* is to be found all along the western shore of Lake Albert between the mouths of the Semliki and the Rutshuru, where it is sheltered by the dense belt of *Phragmites communis* which borders the lake. To the south of Lake Albert, the fly was only found along the Rutshuru and some of its affluents and never above an altitude of 3,900–4,000 feet. The note attached to specimens of *G. palpalis* var. *fuscipes* in the Paris Museum that they were taken on the volcanos of Kivu at heights from 4,800 to 9,700 feet is probably an error in labelling; the author failed to find *G. palpalis* on the shores of Lake Kivu or on the island of Kwidjwi. With regard to the general distribution of *G. palpalis*, males and females occur in about equal numbers in inhabited areas, while males predominate in uninhabited ones; figures of catches at different places are given which support this.

M. Roubaud, in a note to this paper, suggests that the labelling of the specimens referred to may be correct and the result of seasonal migration, and doubts whether the generalisation as to the distribution of the sexes can be accepted, though more or less true of the males in uninhabited places, owing to their greater power of flight.

RINGENBACH (J.) & GUYOMARC'H (—). **Notes de Géographie médicale de la Section française de la Mission de délimitation Afrique équatoriale française-Cameroun en 1912-1913.** [Notes on Medical Geography by the French boundary Commission to Equatorial Africa and the Cameroons in 1912-1913.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 7, 1915, 1 map, pp. 515–546.

In this report which deals with the distribution of sleeping sickness in the areas visited, the following experiment on the value of fat or oil as a protection against tsetse-flies was made during a three days' canoe journey along the Motaba River to Mombellé. The canoe was propelled by 16 natives; the bodies of half of them were well smeared with palm oil and the other half untreated; in three hours 119 flies settled on the greased men and 173 on the untreated ones; in the former case, the flies remained on the body but a very short time and rarely bit, while the untreated men were badly bitten and the flies never left their bodies until gorged.

In the country passed through, man is the sole reservoir of the virus; big game is relatively scarce. Transmission seems to be both direct and indirect, and biting insects other than *Glossina* may play the part of mechanical carriers. Tsetse-flies were very rare in one village, where 12½ per cent. of the population were infected.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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Legroux (R.). **Sur la destuction des poux.** [On the destruction of Lice.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 7, 1915. pp. 470–473.

Exanthematous typhus is transmitted by the bites of lice; *Pediculus humanus* (*vestimenti*) and *P. capitis* are the active agents; *Phthirius pubis* (*inguinalis*) does not appear to be capable of carrying the infection. The author has made experiments with volatile matters derived from coal tar and others, with a view to finding something which would rapidly kill lice at ordinary external and body temperatures of 66° F. and 96° F. The experiments were made on lice 1 hour after feeding; in captivity one meal in 24 hours sufficed, but breeding cannot be kept up on animals and the lice must be allowed to bite man. A cupping glass is a convenient apparatus for feeding, as from 50 to 200 lice may be put into one glass and turned on to the upper part of the fore arm; in from 5 to 10 minutes the louse is gorged and releases its hold. and there is no difficulty in getting it back into the glass. The lice should be kept, when not feeding, at 60° F. to 65° F. in a Petri dish filled with small strips of tissue paper 6 or 7 centimetres long and 1 centimetre wide; they creep between the strips and lay their eggs on the rough edges; oviposition generally takes place after feeding. The best hatching temperature is from 76° F. to 82° F.; it rarely occurs between 61° F. and 65° F. The egg-stage lasts from 8 to 10 days, and 15 days after hatching, the louse is full grown; it begins to bite as soon as hatched. In each experiment, 4 adults, 2 young ones of 6 or 7 days old and 4 well developed females were used. They were put under the edge of a Koch bell-jar of 2,000 cc. capacity on strips of tissue paper and at the opposite edge a drop of the liquid to be tested was introduced, also on a strip of paper, and the bell-jar dropped over it at once. As soon as the louse was observed to lie quite still on its back with the feet retracted, the impregnated paper was withdrawn, the edge wiped free of all traces of the substance used and the bell-jar replaced; in this way an attempt was made to reproduce natural conditions as regards aeration in underclothing. Observations were made as to the state of the lice every half hour for five hours and every hour afterwards up to the twelfth, if the louse remained without motion for 20 hours it was considered to be dead. The following substances were tried; anisol, methylanisol, benzyle chloride, 10 per cent. solution of naphthaline in alcohol and the following essential oils: lemon grass (*Andropogon citratus*), eucalyptus, pennyroyal (*Mentha pulegium*), sage (*Salvia officinalis*) and oil of cloves. The results are recorded in a table, and considering efficiency, cost, etc., the mixture which was most satisfactory, consisted of oils of lemon grass, pennyroyal and eucalyptus, 300 cc. of each, and powdered naphthaline, 100 grms.; the oils evaporate in the order given. Pieces of cloth or felt carrying from 6 to 8 drops of this mixture and fastened to the underclothing at those spots where lice generally congregate, will prevent breeding. To cleanse the clothing, ironing the seams and other doubled or lined parts with a very hot iron is effective; linings should be wetted with five parts of the mixture in 100 parts of alcohol and ironed at once. Military accoutrements should be put into a barrel or other container which can be closed almost hermetically and exposed to the vapour of the mixture at a temperature of from 105° to 112° F.; 5 cc. per cubic metre is sufficient and the exposure should be for 20 minutes per cubic metre. Eggs on the hair may be destroyed by an ointment made from 2 cc. of the mixture and 8 grms. of vaseline well blended.

YAKIMOFF (W. L.). **Contribution à l'étude des Leishmanioses de l'homme et du chien dans le Turkestan russe.** [Contribution to the Study of Leishmaniasis in Man and the Dog in Russian Turkestan.]—*Bull. Soc. Path. Exot., Paris.* viii, no. 7, 1915, pp. 474–503.

Bugs from the beds of soldiers attacked by leishmaniasis and of other patients, as well as bugs which had been deliberately fed on the ulcers, were examined, and in no case were bodies resembling *Leishmania* found in the intestine. An assistant who allowed himself to be bitten by bugs thus fed after 24 hours starvation, suffered no ill effects. Over 100 other insects and 160 Anophelines were also examined with negative results.

LINNELL (R. M. C.). **Some observations on Malaria on Rubber Estates.**—*Trans. Soc. Trop. Med. Hyg., London,* viii, no. 8, July 1915, pp. 239–278, 5 charts.

This paper is chiefly concerned with the use of quinine as a prophylactic against malaria in the Federated Malay States. Flat country can be rendered healthy by open drains, after the jungle has been cleared, but broken country with ravines is difficult to deal with; open drains are there worse than useless and some form of subsoil drainage is necessary. The malaria rate generally shows a double seasonal wave. The first is highest between April and June and coincides with the first increase in the rainfall, the second rise precedes the second increase of rainfall, which occurs in September and October. As many, if not more, reputed malaria-carrying mosquitos can be caught in the healthy as in the wet season. On a healthy estate there was no seasonal wave; malaria-carrying mosquitos can be caught in any quantity all the year round and yet there is practically no fever nor does deep cultivation cause an increase of fever. The increase of malaria does not follow the rainfall in such a way as to give time for a new swarm of mosquitos to be hatched out and become infected. The increase of malaria coincides with the flowering of the rubber trees; this fact is recognised by the Malays. Twenty-four Tamils were taken on arrival from India and were the first to reside in an area surrounded by ravines in which the larvae of *Anopheles* (*Nyssorhynchus*) *maculatus* could be found ni quantities. Their blood was free from malarial parasites, but despite large doses of quinine, the daily average of sickness was over 15 per cent. and rose to nearly 20 per cent., even though the dose was greatly increased. In another unhealthy area the following mosquitos were found:—*Anopheles* (*Nyssomyzomyia*) *rossi*, *A.* (*Myzorhynchus*) *sinensis*, *A.* (*Myzomyia*) *albirostris*, *A. maculatus*, and *A. fuliginosus.* Figures are given of sickness in workers' lines about two miles apart, each set surrounded by ravines in which the larvae of *A. maculatus* swarmed. One set of lines, largely protected by subsoil drainage, showed a very markedly smaller percentage of sick per diem than the other which was not so protected.

Kisskalt (K.). **Die Bekämpfung der Lauseplage.** [The control of the louse pest.]—*Deutsche Med. Wochenschr.*, 1915, p. 154.

Methods of controlling body lice, which can be used when the appliances are available, include baths, fumigation with steam, carbon bisulphide or sulphurous anhydride ; a 5 per cent. cresol soap solution kills lice rapidly, but a 1 per cent. solution of corrosive sublimate has no effect. If the men can be stripped, a dry heat of 160° F. will kill lice and nits in 10 minutes ; the seams of clothing may advantageously be passed through the flame of a candle. Where the clothing cannot be removed, the best preventative is to wear silk underclothing. A 5 per cent. naphthaline ointment, ether, benzine and xylol are recommended, but the mere dropping of these substances into the clothing is not of much use. Aniseed oil is effective owing to its exceedingly unpleasant odour.

Galewsky ( ). **Zur Behandlung und Prophylaxe der Kleiderläuse.** [On the treatment and prevention of the body louse.]—*Deutsche Med. Wochenschr.*, 1915, p. 285.

An alcoholic solution of oil of bergamot, 10–15 per cent., may be rubbed into the clothing or a small bag full of cotton wool soaked in this liquid may be worn round the neck. The cost of oil of bergamot prohibits its use on a large scale and, as an alternative, naphthaline may be put in the bag and sprinkled over the clothing or the body may be dusted with it.

von Marschalko (T.). **Die Bekämpfung der Lauseplage im Felde.** [The control of the louse pest in the field.]—*Deutsche Med. Wochenschr.*, 1915, p. 316.

The author has for years obtained excellent results against lice with rectified turpentine used as a spray or applied with wads of cotton wool after dilution with alcohol. Experiments were also made with ointments containing 50 per cent. of turpentine, lanoline, vaseline and ceresin. Lice exposed to pure turpentine in tubes died in 15 minutes, and with the ointment in 40 to 45 minutes.

Kisskalt (K.) & Friedmann (A.). **Die Bekämpfung der Lauseplage II.** [Control of the louse pest.]—*Deutsche Med. Wochenschr.*, 1915, p. 397.

The vapour of carbon bisulphide is an excellent agent for killing lice ; 100 grms. per cubic metre in a closed vessel will kill both lice and nits in a night. Sulphurous anhydride prepared by burning sulphur or carbon bisulphide is not recommended, as its action is slow, and it damages the wool in the clothes. Coal gas has no effect, but a 5 per cent. cresol soap solution will kill the nits in half an hour. A hot flat-iron is very effective and 10 minutes' exposure to a temperature of 160° F. kills the nits with certainty. Insect powders are useless. An ointment containing 5 per cent. of naphthaline is strongly recommended, but it must be applied freely.

von Prowazek (S.). **Bemerkungen über due Biologie und Bekämpfung der Kleiderlaus.** [Notes on the biology and control of body lice.]—*Münch. Med. Wochenschr.*, 1915, p. 67.

The control of exanthematous typhus involves the destruction of body lice. The adult lice must have a meal of blood twice in 24 hours. The females lay from 70 to 80 eggs on the stitches and hems of underclothing, which hatch in 3 or 4 days; the lice are sexually mature in from 15 to 18 days. It is easier to destroy the adults than the eggs. Xylol, oil of cloves and tobacco decoction, iodoform vapour and asafoetida are recommended; ether is a radical cure. The eggs are best destroyed by fumigation with sulphur in a proper apparatus; if this cannot be done, the clothes may be shut up in an air-tight benzine cask. The ethereal oils, especially oil of anise and oil of fennel, are very effective, and clothing should be rubbed with a 30 per cent. alcoholic solution of the former or a 40 per cent. solution of the latter.

Weidenfeld (S.) & Pulay (E.). **Einige Bemerkungen zur Prophylaxe der Pedikulosis.** [Some remarks on the prevention of Pediculosis.]—*Wien. Klin. Wochenschr.*, 1915, p. 153.

The Carpathian shepherds protect themselves against body lice by smearing their clothing with melted butter. The grease prevents the lice from laying their eggs on the threads and fibres, and it is probable that, the butter becoming rancid, the fatty acids are harmful to the lice. Impregnating underclothing with a mixture of paraffin and oil of anise (100 parts liquid paraffin, 50 parts solid paraffin and 5 parts of oil of anise) is suggested.

Zupnik (L.). **Ueber Zuchtungsversuche von Lausen aus Nissen.** [Experiments on rearing lice from nits.]—*Wien. Klin. Wochenschr.*, 1915, p 564.

Lice cannot be bred from the eggs in vitro. The best method is to take material containing eggs and place it on the body covered with a piece of linen, securing it in position with plaster. In five days the young hatch and an abundance of lice for study can be obtained. This method lends itself readily to the trial of various substances for killing lice, the vapours of ammonia, carbon bisulphide and sulphurous anhydride being found practically useful. Experiments on the transmissibility of disease by the second generation can also be easily carried out.

Swellengrebel (N. H.). **Ueber die Zahl der Flöhe der Ratten Ost-Javas und die Bedeutung des Parallelismus von Flöhe- und Pestkurven.** [On the number of Fleas on East Java Rats and the meaning of the parallel between Flea and Plague curves.]—*Zeitschr. f. Hyg. u. Infektionskrankh.*, Bd. 79, 1915, p. 492.

In East Java traps were set in the villages of the district investigated: the rats caught were taken alive in linen sacks to the laboratory, chloroformed, and their fleas combed out and counted. The house rats (*Mus rattus griseiventer* and *Mus concolor*), the field rat (*Mus rattus* *diardii*), and in a few localities, *Mus norvegicus*, were captured. The fleas found were mostly *Xenopsylla cheopis*; *Pygiopsylla ahalae* was not common. The number of fleas showed periodic variation and there were more rat-fleas in the plague-infected areas than in those apparently plague free. The variations in number bore a definite relation to climatic conditions and frequently, though not always, rose and fell with the number of plague cases. The view of the English Plague Commission that annual plague epidemics are connected with the periodic variation in the number of fleas is borne out by the Java figures, but the author regards the rise in number during an epidemic not as the cause, but rather as the effect, and due to accompanying concentration. The number of rat-fleas in Java varied greatly in different localities and bore no relation to the spread of the plague, which may possibly account for the fact that the intensity of the epidemic varied so greatly in different districts. The author is convinced that the normal flea population is an important factor, though not the only one, in the intensity of an epidemic.

MAGGIO (C.) & ROSENBACH (F.). **Studien über die Chagaskrankheit in Argentinien und die Trypanosomen der "Vinchucas" Wanzen** (*Triatoma infestans*, **Klug**). [Studies of Chagas' diseases in Argentina and of the Trypanosomes of *Triatoma infestans*.]—*Centralbl. f. Bakt. Parasitenkunde etc., Jena*, 8th September 1915, I. abt. originale, Bd. 77, Heft I, pp. 40–46, 2 plates.

Chagas infected healthy individuals of *Triatoma infestans* with trypanosomes of the blood of men and animals and determined that from 8 to 10 days was required before the insect became infective. The special conditions required for infection are not yet fully known; bugs which have bitten infected humans or monkeys are capable of transmitting the disease, but this is not the case if they are fed on infected guineapigs. Brumpt was of opinion that the organism could be transferred also by the faeces of bed-bugs deposited upon the skin or mucous membranes. In Salta, the authors have been able to prove that *Triatoma infestans* contains in its intestinal tract numerous flagellates which closely resemble those described by Chagas; these are described in detail. Bugs from the northern provinces of the Argentine exhibit flagellates in more or less large numbers, while those from the southern regions, such as Rio Negro and Bahia Blanca, were free from parasites. Possibly the lower temperature of these areas is not favourable to the development of the trypanosome. Of 171 insects from Salta, 71 were infected; the adults showed a much higher proportion of infection than the larvae and nymphs, 59 against 1·8 per cent. This leads to the suspicion that the adults had become infected outside the houses, where almost the whole of the material examined was collected; the existence of an outside animal carrier or reservoir is possible. Laboratory observations show that the whole life-cycle of *T. infestans* is completed in 1½ years in Buenos Aires; there was no sign of flagellates in the second generation and hereditary transmission seems to be excluded. When healthy and infected bugs were kept together and allowed to feed on healthy animals, the healthy insects were found to become infected after 3 months. The infection probably takes place through ingestion of faeces or the biting of one bug by another. Attempts to infect directly guineapigs and young dogs failed, but the subcutaneous or intraperitoneal injection of infected faeces caused trypanosomiasis; white mice, young white rats, guineapigs, and young dogs, sheep, goats, cattle and horses resisted infection. The authors were able to infect bugs with *Schizotrypanum cruzi* and to retransmit the trypanosome through the faeces of such infected bugs. When bugs were fed on guineapigs infected with mal de caderas, the trypanosomes disappeared very rapidly from their alimentary tract.

MITCHELL (P. C.). **Practical Advice on the Fly Question.**—*Zool. Soc. London*, August 1915. 7 pp.

The following measures are recommended for the control of house-flies, stable-flies, blow-flies and blue-bottles. All food and drink should be covered with gauze screen, muslin, etc. A poisoned bait can be made from formalin and milk and water. All kitchen refuse should be disinfected with crude disinfectant, using 2 oz. to a pint of water. Garden refuse should be placed in wire receptacles, through which the air can circulate freely. The temperature in this way is kept low and the development of the larvae retarded. In municipal refuse-tips, sodium arsenite can be used as an insecticide. Stable manure should be stacked in heaps and covered with a layer of earth mixed with green-tar oil or neutral blast-furnace oil at the rate of 1 gal. oil to 40 gals. earth. The ground surrounding the heap for a distance of 12 inches from the base should be oiled to prevent the emergence of migrating larvae. In camps, tents should be sprayed with "fly-bane," a non-inflammable mineral oil. For the face, hands and clothes, a fly-cream made of white-birch oil or winter-green oil should be used.

MACDOUGALL (R. S.). **Insect pests in 1914.**—*Trans. Highland & Agric. Soc. Scotland.* 1915. Reprint 27 pp., 20 figs. [Received 27th September 1915.]

Both *Hypoderma bovis* and *H. lineata* are present in Scotland. During the summer of 1914, Mr. H. G. Steven examined 190 full-grown maggots taken from the hides of flayed beasts near Edinburgh; 148 proved to be the larvae of *H. bovis*, the remaining 42 those of *H. lineata*. A hide of the red deer was received by the author with several holes due to the warble of the deer, *H. diana*. Large numbers of these skins are more or less injured, their value to glovemakers being reduced by quite one-half.

CLELAND (J. B.). **Researches on Plague.**—*Rept. of the Director-General of Public Health, New South Wales, for the year 1913, Sydney*, 1915 pp. 181–182.

In connection with routine measures taken for the detection of the presence of plague and the prevention of its spread, 10,615 rats and mice were examined during 1913. No plague was found in any of the specimens. The fleas collected were:—*Xenopsylla cheopis*, *Ctenopsylla musculi*, *Ceratophyllus fasciatus* and *Ctenocephalus felis*. The first-named was much the most numerous, 213 out of a total of 390 examined belonging to this species.

FERGUSON (E. W.). **Notes on Mosquitoes.**—*Rept. of the Director-General of Public Health, New South Wales, for the year 1913, Sydney,* 1915, pp. 238–240.

During the year attention was paid to the collection and identification of mosquitos. *Ochlerotatus* (*Scutomyia*) *notoscripta* was the commonest species during early summer, while in the hottest months *O.* (*Culicelsa*) *vigilax* was abundant. *Anopheles* (*Nyssorhynchus*) *annulipes*, Walk., was found in several localities, being particularly numerous near the Murray River. The following species were also obtained :—*Mucidus alternans*, Westw. ; *Stegomyia fasciata*, F. ; *Ochlerotatus* (*Culex*) *australis*, Er. ; *O.* (*C.*) *rubrithorax*, Macq. ; *O.* (*C.*) *occidentalis*, Skuse ; *O.* (*Culicelsa*) *alboannulatus*, Macq. ; *O.* (*Culicada*) *vittiger*, Skuse ; *O.* (*C.*) *fergusoni*, Taylor ; *O.* (*C.*) *clelandi*, Taylor ; *O.* (*Grabhamia*) *theobaldi*, Taylor ; *Coenocephalus concolor*, Taylor ; *Culex fatigans*, Wied. ; *C. tigripes*, Grp. ; *C. biocellatus*, Taylor ; *C. sitiens*, Wied. (*Culicelsa annulirostris*, Skuse) and *C.* (*Culicelsa*) *linealis*, Skuse.

CLELAND (J. B.). **Prevalence of Domestic Flies in the Lower Hawkesbury River District, New South Wales.**—*Third Rept. of the Government Bureau of Microbiology, for the year 1912, Sydney,* 1914, pp. 155–160, 1 table.

During part of 1911 and the whole of 1912, counts were made at the Milson Island Experiment Station in order to determine the relative prevalence at different periods of the year of various species of domestic flies. It was found that *Fannia canicularis* was relatively more abundant in September and October than *Musca domestica*. It seemed to diminish both relatively and numerically from December onwards through the summer, autumn and winter months. *M. domestica* began to appear at the end of October, but did not increase markedly until June. It appeared to vary numerically a good deal from undetermined factors almost from day to day in some months. Its actual numbers were dependent on the proximity of suitable breeding places, which fact might perhaps account for the great variations. The results of the counts are given in tabular form.

CLELAND (J. B.). **Further Investigations into the Etiology of Worm-nests in Cattle, due to *Onchocerca gibsoni*.**—*Third Rept. of the Government Bureau of Microbiology, for the year 1912, Sydney,* 1914, pp. 135–153, 5 plates, 3 tables.

In 1910–11, researches carried on by the author led him to the conclusion that *Stomoxys calcitrans* was in all probability the carrier of *Onchocerca gibsoni* from one bovine host to the next. Though this point is not as yet definitely decided, certain important results have been obtained. These are :—(1) various MUSCIDAE, as well as mosquitos, can ingest embryos of *O. gibsoni* when given access to a freshly-opened nodule ; (2) in the case of *S. calcitrans*, embryos can be ingested and remain alive within the alimentary canal of this insect for 3 days, while they have not been detected alive in *Musca domestica* and *M. vetustissima* after 24 hours ; (3) the depth at which embryos of *O. gibsoni* are found below the surface of the abdomen of the host was in many instances much less than the length of the proboscis of *S. calcitrans*. As yet all attempts to convey infection by *S. calcitrans* have failed and no further development of the embryo as been found in the fly. Of the mosquitos present on Milson Island, *Ochlerotatus* (*Culicelsa*) *vigilax* is most abundant and is a persistent biter. Failure to transmit the disease by *S. calcitrans* increases the probability of *O. vigilax* being a carrier. Future investigations might be directed with advantage along the following lines:—(1) further experiments with *S. calcitrans* to ascertain whether wild flies in affected districts can transmit embryos and whether caged flies can be artificially infected and then transmit embryos; (2) similar experiments with *C. vigilax*; (3) immunity experiments to ascertain whether the injections of emulsions of adult worms can play any part in conferring immunity on calves.

S. calcitrans is abundant at Milson Island, in New South Wales, Melbourne, Adelaide and Perth. Cattle and horses are the preferred hosts, and attacks on man are rare. The lower parts of the legs of the animals or the scrotum in bulls are chiefly attacked. The worms, if injected at these points, would have to pass up the leg to the ventral surface of the body, finally burrowing under the pectoral muscles and the external obliques, where they may come to rest, or may migrate to a more superficial position. Infestation of sheep is rare, and it must be inferred that these animals possess a natural resistance to the parasite. A detailed account of the examination of cattle on Milson Island naturally infected with worm-nests is given.

ELKINGTON (J. S. C.). **A Review of Recent Literature and Work on the Epidemiology of Plague.**—*Commonwealth of Australia, Quarantine Service, Melbourne.* Service Publication no. 5, 1915, 32 pp., 1 map.

Certain salient features in the world distribution of plague are recorded in this paper. In India, since 1897, the disease has maintained its virulence and increased its area of activity. Plague has remained endemic in England for several years and the recent occurrence of pneumonic cases in Suffolk on the site of previous outbreaks illustrates the tenacity with which it can cling to a locality. The outbreak of pneumonic plague in Manchuria in 1911 should serve to dissipate any idea that plague is a disappearing disease. Australia is threatened with this disease from Java, New Caledonia and Colombo.

The practical measures of organised activity against the admission and spread of plague are as follows:—(1) the collection, collation, and distribution of information concerning the development of new centres of infection; (2) control and supervision of oversea shipping, designed to prevent the introduction of infection from human cases or infected rats; (3) systematic fumigation on vessels for the destruction or reduction of their resident rat population; (4) organised operations for the control of the rat population of towns; (5) systematic biological examination of rats and their parasites; and (6) arrangements for the notification of cases occurring on shore and for application of appropriate sanitary measures.

Although the usual history of a plague outbreak traces back to an antecedent epizootic among rats, notable exceptions occurred in Manchuria in 1910, in the Philippine Islands in 1912, and in Colombo in 1914. Even where the phenomenon of an antecedent rat epizootic is found, the earlier manifestations are not infrequently obscured. The supervision of the rat population should include systematic bacteriological examination of rat carcases and determination of the presence or absence of *Xenopsylla cheopis* and other rat-fleas, together with an examination of the bacterial content of the parasites.

Pneumonic plague is exclusively conveyed from man to man, whereas bubonic plague is spread by rats. The advisory committee on plague in India has summarised the position with regard to infection by rat fleas as follows :—(1) Multiplication of the plague bacillus takes place in the stomach of the flea. (2) The average capacity of the flea's stomach is 0·5 c. mm. On this basis a flea imbibing the blood of a plague rat might take 5,000 germs into the stomach. (3) The approximate proportion of fleas in the stomach of which the multiplication of plague bacilli takes place varies with the season of the year, being 6 times greater in the epidemic than in the non-epidemic season. (4) Plague bacilli are present in the rectum and faeces of fleas taken from plague rats and such faeces are infective to guinea-pigs, both by cutaneous and subcutaneous inoculation. (5) During the plague season, fleas might remain infective for 15 days after imbibing infective blood, but during the non-epidemic season no individual was infective after the 7th day. (6) A single flea of either sex may transmit the disease. (7) The plague bacillus has never been seen in the body cavity or salivary glands of infected fleas. In the Dutch Indies, fleas have been shown to be infective up to 28 days. [For investigations relating to the bionomics of the rat-flea see this *Review*, Ser. B, ii, pp. 62–64, 131 & 190.]

Differences of opinion exist concerning the presence of rats on board vessels and their relative ability to surmount difficulties of transit to shore. *Mus decumanus* appears to be a better swimmer than *M. rattus* and easily crosses a distance of 200 to 300 yards in smooth water. *M. decumanus* is inferior to *M. rattus* and *M. alexandrinus* as a climber and jumper, but all three species are adepts at sheltering themselves in small spaces. Certain goods imported into Australia, e.g., oil-cake in sacks, bamboo poles in bundles covered with matting, loose hemp in bundles, etc., afford places of concealment. The internal protection of vessels against access of rats to food-stuffs and edible refuse is a problem which requires constant attention. The use of small meshed wire netting is an essential feature of such operations.

PLACE (F. C.). **Flies, a Factor in a Phase of Filariasis in the Horse.**—*Adelaide, N.D.* 7 pp. [Received 11th September 1915].

Investigations made by the author in India during 1898 resulted in the discovery of a connection between certain flies and a form of cutaneous filariasis of the horse. One of the chief sites of infection was shown to be the glandular tissue of the eyelids, especially the membrana nictitans. Since 1910 the frequency with which neoplastic growths of the eyelids of horses has been observed in Australia, and the common occurrence of worm nodules in the stomach have led to the observation of a causal connection between flies and these neoplasms. A form of tetanic immobility of the membrana nictitans arising apparently from constant irritation by flies has been noted in the season when flies were abundant. The ducts of the lachrymal gland are such that they are easily penetrated or perforated by the proboscis of *Musca domestica* or *Stomoxys calcitrans.* The custom in South Australia of bedding horses upon dung leads to the rapid multiplication of these flies, as well as of *Muscina stabulans.* The eggs are laid in the dung of the horse, kangaroo, wallaby or rabbit. In the course of autopsies on 150 horses, about 91 per cent. showed nematode tumours in the stomach and nearly 50 per cent. exhibited growth upon the membrana nictitans or suffered from opacity of the cornea. In India, intra-ocular filariasis is due to the presence of *Filaria papillosa*, but in Australia no adult worms have been discovered in the anterior chamber of the eye. Nematode parasites have been found in the head of *Stomoxys calcitrans* and *Musca domestica* and have been observed to survive for 2 days after the death of the fly. Horses must therefore ingest the larvae surviving in the moisture of the chaff and these are ultimately found in the submucosa of the stomach. Larval worms are doubtless vomited in large numbers upon the chaff by flies, and fly pupae have been found in the stomach of the horse, and these may constitute a source of infection.

Continuous application of ice and silver salts, such as the nitrate, appear to destroy the irritant nematodes. The control of the distributing agents, namely, flies, is by far the more important measure. Frequent disturbance of the dung is useful, but periodical spraying of dung with poisonous compounds is too dangerous to be practicable. A dry stable floor will retard the development of the larvae. Traps of wire gauze set in convenient openings will materially reduce the numbers of adults. Bunches of eucalyptus leaves, hung from the roof of the stable, attract flies towards evening and large numbers can be caught by slipping bags over the leaves.

Strength of the Dipping Tank.—*Rhodesia Agric. Jl., Salisbury*, xii, no. 4, August 1915, pp. 444–446.

Recent outbreaks of African Coast fever in Mashonaland have shown that in some cases the fluid in dipping tanks was not up to the required strength. It is advisable to maintain the fluid in the tank always at a certain level. Each animal passing through the tank removes approximately half a gallon of fluid and this must be replaced. If, previous to dipping, the level is found to have dropped, the loss is due to evaporation and water only must be added. The dipping fluid is liable to undergo chemical change and should be submitted to laboratory test from time to time. A fluid of correct strength is obtained by allowing 1 gal. of Cooper's Improved Cattle Dip to 200 gals. water. Experiments carried out at Salisbury to determine whether oxidation of arsenical dipping fluids can be prevented by the application of disinfectants gave unsatisfactory results. In connection with the apparent loss of arsenic by oxidation, it does not appear necessary to renew a dip in which a fair number of cattle are dipped at short intervals, until it has become too dirty for use.

BEVAN (L. E. W.). **African Coast Fever.**—*Rhodesia Agric. Jl., Salisbury,* xii, no. 4, August 1915, pp. 468–483, 4 figs., 7 plates.

African Coast fever is essentially a disease of bovine animals, caused by *Theileria parva*, parasitic in the red blood corpuscles. Development of *T. parva* takes place partly in the tick and partly in the ox. The incubation period in the latter is 10 or 12 days. About 75 per cent. of the blood corpuscles are invaded by the parasite. The average time from the day of infection until death is about 30 days. In animals habituated to arsenic by constant dipping, the infective processes are retarded and the average period of incubation may be extended to 16 days.

SINCLAIR (J. M.). **Veterinary Report.**—*Rhodesia Agric. Jl., Salisbury,* xii, no. 4, August 1915, pp. 546–550.

In April 1915 several outbreaks of African Coast fever occurred. An outbreak in the Mazoe district was undoubtedly contracted during the passage of the herd through the Bedford Estate. Further cases were reported during June. Where possible, infected herds were removed to clean veld, after being kept in camps where their temperature was observed, and were dipped or sprayed regularly. Where no clean veld was available, the animals were dipped or sprayed every third day. Several deaths from trypanosomiasis occurred in the Hartley District. Tsetse-fly [*Glossina morsitans*] was plentiful a short distance across the border ; the cases reported may have been the result of extension of the fly areas up the valleys in consequence of the heavy rains of the previous season.

DE MELLO (F.). **Preliminary Note on a New Haemogregarine found in the Pigeon's Blood.**—*Ind. Jl. Med. Research, Calcutta,* iii, no. 1, July 1915, pp. 93–94, 1 plate.

A new Haemogregarine was found in the blood of pigeons in Mapuca (Bardez), which were infested by the Hippoboscid, *Lynchia maura*. This insect may harbour the sporogenic forms of the parasite, but these have not as yet been detected by dissection.

AWATI (P. R.). **Studies in Flies (i).**—*Ind. Jl. Med. Research, Calcutta,* iii, no. 1, July 1915, pp. 135–148, 6 figs., 3 plates.

This paper deals with the chaetotaxy and pilotaxy of the MUSCIDAE and the range of variability in the genus *Musca*.

CHRISTOPHERS (S. R.) & CHAND (K.). **Notes on some Anophelines from Arabia and Mesopotamia.**—*Ind. Jl. Med. Research, Calcutta* iii, no. 1, July 1915, pp. 180–200, 2 plates, 1 tables.

The collections of Anophelines here described were obtained from the Aden Protectorate, Muscat and Lower Mesopotamia. The Arabian Anopheline fauna is shown to be markedly African in character.

Arabian specimens of *Anopheles rhodesiensis*, Theo. (*A. d'thali*, Patton), were obtained from small pools in the bed of the Tiban River. In Muscat, the larvae were found in holes in volcanic rock fed by underground water, in contradistinction to those of *A. funestus*, which always occur in water having perceptible movement. Some adults were caught in houses. This species is distributed in Africa, Arabia, Baluchistan and Quetta. *A. turkhudi*, Liston, has not been recorded east of longitude 80° and is commonest in the north-west of India, facts which suggest that its main area of distribution is further west. *A. cinereus*, Theo., *A. costalis*, Theo., and *A. pretoriensis*, Theo., are recorded. The Mesopotamian species described are *A. stephensi*, Liston, *A. pulcherrimus*, Theo., and *A. sinensis* var. *mesopotamiae*, var. n.

STRICKLAND (C.). **Note on *Anopheles brevipalpis*, Roper, and description of its egg and larva.**—*Ind. Jl. Med. Research, Calcutta*, iii, no. 1, July 1915, pp. 201–204, 1 plate.

Specimens of *A. brevipalpis*, Roper, were captured at Morib, Selangor, F.M.S., in December 1914. Malaria was prevalent in the district at this period and this species was probably the cause of the outbreak. Young larvae were reared from eggs deposited by the captured females. None reached maturity, owing to attack by a species of *Vorticella*. A new genus, *Memnemyia*, is proposed for this species.

HEADLEE (T. J.). **The Mosquitoes of New Jersey and their Control.**—*New Jersey Agric. Expt. Sta., New Brunswick, N. J.*, Bull. no. 276, 30th January 1915, 135 pp., 94 figs. [Received 11th September, 1915.]

Forty species of mosquitos are known to occur in New Jersey; of these, 20 are troublesome and 6 are classed as pests. They may be classified into salt-marsh, swamp, woodland and house groups.

The salt-marsh group includes *Anopheles quadrimaculatus*, Say, *A. crucians*, Wied., *Ochlerotatus* (*Aedes*) *sollicitans*, Wlk., *O.* (*A.*) *taeniorhynchus*, Wied., *O.* (*A.*) *cantator*, Coq., and *Culex salinarius*, Coq. The first is essentially a frequenter of houses; the second breeds both in salt marsh and swampy areas inland; the remainder breed exclusively in the salt marshes. The most important natural enemies of this group are certain fish, namely, *Fundulus majalis* (striped killifish), *F. heteroclitus macrolepidatus* (common killifish), *F. diaphanus*, *Lucania parva* (rainwater fish) and *Cyprinodon variegatus* (variegated minnow). The control of the salt-marsh mosquitos is a matter of so draining the marsh that the water is drawn off at frequent intervals or is kept constantly supplied with some of the above fish. When an opening to the ocean is impossible, the breeding area is trenched with ditches 10 inches wide and 30 inches deep, which communicate with each other or with a central pool, which is constantly stocked with fish. The use of dykes and sluice-gates is a phase of salt-marsh drainage which merits careful consideration as a means of eliminating mosquitos. When the position of a marsh is such that the improvement is financially worth while, mosquito breeding can be eliminated by filling in the breeding area with soil or garbage.

The house group includes *Culex pipiens*, L., *C. restuans*, Theo., *Anopheles quadrimaculatus*, Say, *A. punctipennis*, Say, and *A. crucians*, Wied. *A. quadrimaculatus* is responsible for the transmission of tertian and quartan malaria ; *A. crucians* is a carrier of the tropical aestivo-autumnal type, but this rarely occurs in New Jersey.

The most important members of the swamp group are *Ochlerotatus* (*Aedes*) *sylvestris*, Theo., and *Taeniorhynchus* (*Coquillettidia*) *perturbans*. The woodland group contains species breeding in woodland pools and in more open places. The winter is generally passed in the egg-stage ; a large brood is produced early in the season and the adult stage is passed in the neighbourhood of the breeding place. *Ochlerotatus* (*Aedes*) *canadensis*, Theo., and *O.* (*A.*) *subcantans*, Felt, are the most important species. The control of all species breeding in fresh water involves the removal of all situations which can serve as breeding places for the larvae. This can be accomplished by drainage, filling in with ashes, mud or sand, stocking with fish or oiling. Woodland areas near dwellings should be inspected during late March, April and early May. The control of the malarial and house species demands attention from the middle of May to the beginning of October. Examination of standing water should take place every 10 to 14 days. In salt-marsh localities, observation should be made from early spring until autumn, especially after rains and high tides.

Barber (M. A.), Raquel (A), Guzman (A.) & Rosa (A. P.). **Malaria in the Philippines**—*Philippine Jl. Sci., Manila*, x, Sec. B., no. 3, May 1915, pp. 177–245, 1 fig., 10 tables, 2 plates. [Received 17th September 1915.]

The object of the investigations recorded in this paper was to study more widely the distribution of the commoner Anophelines of the Philippine Archipelago and the distribution of endemic malaria as determined by the parasite and spleen index of children of ten years of age or less. The commonest species of *Anopheles* in the portion of the Philippines covered by the survey was *A. rossi*. *A. minimus* (*febrifer*) and *A. barbirostris* came next in order of abundance ; of these, *A. minimus* has the more restricted habitat. *A. sinensis*, which ranked fourth, mainly breeds in rice-fields and may occur in considerable numbers under certain circumstances. *A. rossii* has been found in very salt water, rivers, roadside puddles, rice-fields and foul water containing soaking cane. *A. barbirostris* is commonest in fresh water where aquatic plants are abundant. *A. minimus* has not been found in brackish water and tends to avoid water in which there is decaying vegetation. The general character of the soil does not seem materially to affect the breeding of this species ; brooks or small rivers are preferred to swamps. The different seasons in the Philippines affect the breeding of *Anopheles* chiefly through diminution of breeding places in the dry season and the flushing of streams during the wet season. In artificial ditches of running water the amount of flow varies less than in brooks, so that the breeding is less affected.

The behaviour of mature Anophelines, especially with reference to their habits of visiting houses and biting man, is important in the dissemination of malaria. The avidity for human blood is shown in the following percentages of females which took advantage of one opportunity to suck blood: *A. rossi*, 63·6; *A. barbirostris*, 49·4; *A. minimus*, 54·8; *A. maculatus*, 50·0 and *A. sinensis*, 67·8 per cent.

The results of these investigations tend to confirm the preliminary conclusion of Walker & Barber that the chief carrier of malaria in the Philippines is *A. minimus*. The mosquito survey has shown the wide distribution of this species, the abundance of its breeding places and the large number of larvae often found in them. It is a house-frequenting form and readily bites human beings. Its distance of flight is at least 170 paces, and the number found in houses in some localities was large in comparison with the number of larvae found in the neighbouring breeding places. The distribution of malaria agrees in general with the distribution of this species. In every malarious town the larvae were found in or near the locality or adults were caught in the houses. The high rate of malaria occurring in "ditch" towns, where *A. minimus* breeds close to houses, tends to strengthen the evidence against this species. *A. rossi* is responsible for little, if any, transmission of malaria. There is also little correlation between the breeding places of *A. barbirostris* and *A. sinensis* and the presence of indigenous malaria. *A. maculatus* probably transmits malaria in certain localities and at certain seasons. Watson believes that *A. maculatus* is the chief carrier in certain hill regions of the Malay States. He records this species from an island off Singapore where malaria is intense, and from Hongkong. In any case, anti-malarial measures directed against *A. minimus* would be equally efficacious against *A. maculatus*, which has similar habits.

March, April and May, in the hot season, are the months which are most free from malaria. It is probable that the mortality from this disease in the Philippines has been overestimated. If, as the results indicate, the transmission of malaria is mainly due to a mosquito of rather limited habitat, the prospect of eradicating or reducing the carriers in many localities is encouraging. Antimalarial measures should be based on a thorough *Anopheles* and malaria survey. The best single measure is the destruction of larvae of malarial carriers, and in this work the breeding places of the stream-breeders should receive first attention. Permanent good may be accomplished by clearing the stream bed so as to make it narrower and swifter. In the Malay States a great diminution of the disease has been brought about by subsoil drainage of the clear streams in which *A. maculatus* breeds. Such a measure would be difficult to carry out in most localities in the Philippines. Larvicides are cheaper and at present offer a more practical method for mosquito destruction in these islands. From 95 to 100 per cent. of the larvae of *A. minimus* may be destroyed by one application of any larvicide when it is well distributed in the breeding places. While drainage has undoubtedly played a considerable part in the diminution of malaria in some countries, it seems that extensive cultivation of the soil might prove an important factor. Not only the diminution of water, but the rendering of it unfit for mosquitos is to be considered.

Among the natural enemies of stream-breeding mosquitos, the following have been encountered:—*Ranatra* sp., the larvae of a Dytiscid beetle, flies, tadpoles and certain fish. Where larvae are protected by algae, grass, stones or floating débris, they have been observed to breed in large numbers in the immediate presence of their enemies. The clearing of jungle has been a factor in the reduction of malaria in some parts of the Archipelago. A preliminary survey should be undertaken when new territory is to be opened up. Quinine prophylaxis is generally considered advisable only as a temporary measure, or, in an intensely malarious region, as a remedy where permanent antimalarial measures are impracticable.

LYON (H.). **Notes on the Cat Flea** (*Ctenocephalus felis*, **Bouché**).—*Psyche, Boston, Mass.*, xxii, no. 4, August 1915, pp. 124–132, 2 figs., 1 plate, 2 tables.

The observations contained in this paper were made in connection with some attempts to devise a method for the propagation of fleas to be used for experimental purposes and relate primarily to the seasonal abundance of the flea. The monthly average varied from 1·08 to 10·05, the greatest number being found in July. A possible etiological connection between fleas and poliomyelitis or infantile paralysis has been suggested, but some investigators have not been able to harmonise the persistence of fleas through the winter with the very slight incidence of poliomyelitis during this part of the year. The data here recorded show that in a climate like that of New England the seasonal prevalence of these insects agrees in some respects with the seasonal incidence of the disease.

The adult fleas obtained after each combing could not be kept alive in the laboratory for more than 5 days. Two cats infested with fleas were therefore kept in the insectary and eggs were obtained from their sleeping-places. The eggs with the débris from the beds were put in Petri dishes and these were placed in small jars, one-third full of water. The jar was covered and placed out of the direct sunlight at the room temperature. Floor sweepings and dried blood were occasionally added. Moisture was found to be essential for good results. The life-cycle, from egg to imago, was completed in from 13 to 33 days. The egg-stage lasted 2 to 8 days, the larval 7 to 18 days, and the pupal 2 to 14 days. Observations on the anatomy of the larva are appended.

LYON (H.). **Does the House-fly hibernate as a Pupa?**—*Psyche, Boston, Mass.*, xxii, no. 4, August 1915, pp. 140–141.

The following experiments were performed during the winter to determine whether it was possible for the house-fly to hibernate in the pupal stage. Thirty-seven lots, each consisting of 100 pupae, were buried in wet and dry sand, loam, horse manure and leaf mould. The containers were placed, some out of doors in sheltered and exposed positions, others under greenhouse conditions, and others in a basement. The experiments were begun on 19th October 1914; flies continued to emerge until December from the jars stored in the basement, where the temperature was about 60° F. throughout the winter. The majority emerged from wet and dry manure and wet sand. In the greenhouse, 364 adults emerged from 1,100 pupae, the largest number coming from wet manure and dry sand. The last adult emerged on 24th November. No adults emerged out of doors, where the temperature was slightly lower than in the greenhouse. On 23rd June 1915, the contents of the jars were examined. No parasites or fungi were present, but the pupae were completely dried up. The results indicate that the house-fly cannot readily hibernate as a pupa, although it can emerge until the middle of winter. It would seem that the appearance of seemingly freshly-emerged adults during late winter and early spring should be accounted for in some other way.

Riley (W. A.) & Johannsen (C. A.). **Handbook of Medical Entomology,** *Ithaca, N.Y.*: Comstock Publishing Co., 1915, 348 pp., 174 figs. Price $2.

This book is described in the preface as the outgrowth of a course of lectures given by the senior author in the Department of Entomology of Cornell University, during the past 6 years, and more specifically, it is an illustrated revision of "Notes on the Relation of Insects to Disease" published in January 1912. It has the defects of almost all books prepared in this way in that the reader does not always find the information he requires in the place in which it might be expected. The first chapter on Arthropods which are directly poisonous is a useful feature in the book as an assemblage of facts which must otherwise be searched for in isolated papers and monographs, and some of the illustrations to this chapter from the late Dr. Slingerland's photographs are particularly good. This cannot be said of many figures of insects in the body of the book, which are too diagramatic to be of any value for the purposes of identification; some of the illustrations of the eruptions produced by Acarids might well have been omitted; they are not good in themselves and are much too small to be of any value for diagnostic purposes. The authors perhaps naturally deal with insect-borne diseases rather from the American than the old world point of view, and pressure of space is probably the reason for this. Surely, however, Bruce is entitled to some of the credit for the idea that the specific trypanosome of sleeping sickness is carried by *Glossina palpalis,* but the reader, who is not aware of Bruce's share in the discovery, would not gather it from the account given of the disease in this book. Six pages are devoted to the evidence that pellagra is *not* carried by *Simulium*, though a little more space might usefully have been given to *Phlebotomus*, the fevers caused by its bite, and especially the distribution of these insects. Dr. King's reasons (published in 1883) for believing that the mosquito was probably the carrier of malaria are given at length. Knab's warning that every blood-sucking insect is now suspected as a possible disease carrier and that insufficient thought has been given to the conditions and characteristics of the individual species which make disease transmission possible, is quoted in conclusion. A synoptic key to the Arthropods known or believed to be noxious to man is given and a bibliography is added of recent works on the subject covering 13 pages, which, in the preface, is admitted to be incomplete. Anything approaching a complete bibliography of such a subject would be almost impossible of compilation, but, in this case, it is not by any means so nearly up to the date of publication as it might have been; possibly the remark in the preface that the enormous literature of isolated articles is to be found principally in foreign periodicals, and is therefore difficult of access to many American workers, may explain this defect. So many works on this subject have been published recently that it is almost impossible to handle it from a new standpoint. This book will take its place with others as a possible source of information which they do not contain and will therefore be useful to many readers.

PORTCHINSKY (I.). **Русскій оводъ, паразитъ лошади, выпрыскивающій личинокъ въ глаза людей.** [*Rhinoestrus purpureus*, Br., a parasite of the horse, injecting its larvae into the eyes of men.] **«Труды Бюро по Энтомологіи Учен. Комит. Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration & Agriculture*], *Petrograd*, 1915, vi, no. 6. Third, enlarged edition, 42 pp., 9 figs., 1 colrd. plate.

Rhinoestrus purpureus, Br., was first discovered to be a parasite of the horse in 1886. In western Europe it is common only in Hungary and Italy, although also found in Austria and Spain; in Russia it is found everywhere, except in some of the northern governments. Previous to its discovery and description by Brauer, it was undoubtedly mistaken for other species such as *Gastrophilus haemorrhoidalis* and *G. nasalis*. It seems clear that, when describing *G. nasalis*, Linnaeus confused three distinct species, viz., *Cephenomyia trompe*, *G. nasalis* (*veterinus*) and *R. purpureus*. Within a year of its discovery, the author received a specimen of *R. purpureus* from Semipalatinsk and it was stated by the sender that this insect injects its larvae into the eyes of man. It is chiefly found in low-lying steppe districts, avoiding mountainous ones and is said to be much feared by the native Kirghis. An attack on the eyes is followed by great pain and may prove fatal, if remedies are not quickly applied. In 1895 the author received similar reports from Dr. L. A. Kusnetzov at Atbassar, in the province of Akmolinsk, which have satisfied him that such attacks on man are quite a normal occurrence in places where these flies occur in large numbers; similar cases were also reported by Elia Baquis from Italy. *R. purpureus* is also found in Asia Minor and in Africa, where it breeds in the nasal cavities of the horse and zebra; a related species, *R. hippopotami*, Grünberg, is found in Africa, in the skull of the hippopotamus.

When attacking its normal host, the horse, *R. purpureus* injects its larvae mostly into the nostrils, but frequently also into the eyes of the animal, whence the larvae find their way into the nasal cavities and mouth; larvae were found by V. Sokolov in the eyes of horses in the province of Akmolinsk in 1900. Horses which are generally indifferent to *Gastrophilus equi* (*intestinalis*), become restless in the presence of this fly, shaking their heads and snorting, apparently to prevent the larvae from getting into their nostrils. Horses usually become infected late in summer. The further development of the larvae during the autumn and winter has not yet been fully studied, but their presence becomes evident again in the spring, or beginning of summer, when they are mature. Before dropping from the nostrils, they may give rise to fits and other symptoms, often mistaken for strangles, and sometimes lead to the death of the animals.

A description is given of the various stages of the larva, which is specially adapted to attach itself firmly to the mucous membranes of the host. The imagines of *R. purpureus* occur during the whole summer. They do not feed during their short life and are active only during the warm part of the day, the females being especially so when sexually mature.

For the control of this fly, the author advises making use of its habit of resting on elevated objects in the fields, such as fences, stones, etc., among excreta of birds, which they much resemble, where they can be easily caught by hand. By putting up trap fences in pastures and collecting the insects from the woodwork every day, preferably in the morning, large numbers can be destroyed. Trap boards must face with one side south and one side must be protected from the prevalent winds. The same remedy can also be utilised against *Cephalomyia maculata*, Wied., in districts where camels are kept.

COOPER (W. F.) & LAWS (H. E.). **Some Observations on the Theory and Practice of Dipping.**—*Parasitology, London*, viii, no. 2, September 1915, pp. 190–217, 2 figs., 1 plate.

This paper contains an account of investigations carried out at Elliotdale, British East Africa, on the process of dipping as a means of tick eradication. A brief description of the dipping bath is given. The process of dipping is very rapid and economical; from 400 to 600 head of stock can be dipped in an hour at a cost of $\frac{1}{3}$ to $\frac{1}{4}$ of a penny per head. The concentration of the fluid should vary according to the interval between each successive dipping and the species of tick to be killed. South African ticks may be divided into three classes in this respect, of which *Margaropus* (*Boophilus*) *decoloratus* (blue tick) forms one; *Amblyomma hebraeum* (bont tick) and *Hyalomma aegyptium* (bont-legged tick), a second; and *Rhipicephalus appendiculatus* (brown tick), the third. *A. hebraeum*, which is important as a transmitter of heartwater, is most difficult to kill; the dipping-fluid must be moderately strong and an interval of two weeks between the dippings is sufficient. The life-cycle of *R. appendiculatus* is so short that dipping must be repeated at frequent intervals. An interval of three days was adopted; this was subsequently lengthened to five days, since it was found that the stock remains distasteful for at least two days after dipping. The addition of an emulsion to sodium arsenite solution allows the concentration of the solution to be considerably reduced without decreasing the effectiveness of the wash, and at the same time the stock can be used continually for work and ploughing. A separate bath should be used for sheep. Instead of making the cattle swim through a bath, they may be driven through a tunnel into which the dipping-fluid is sprayed by means of suitably arranged jets. The spray bath, although condemned as being less thorough in its effects, has been successfully used at Elliotdale in all the investigations. The use of a too concentrated fluid gives rise to the so-called "scalded" condition.

Conflicting views are held as to whether the tick absorbs the poison through its skin or imbibes it with the blood which it sucks from its host. Experiments tend to prove that the second view is the more correct one. The fact that engorged females are rendered infertile by mere immersion in the dipping-fluid, can have little effect in practice, inasmuch as real success is only attained by killing the ticks before they can lay eggs. Experiments to determine the effect of an emulsion on the dipping-fluid showed that a solution of sodium arsenite containing only 0·153 per cent. of As_2O_3, to which sufficient emulsion had been added, was as efficient as a pure solution containing 0·225 per cent. of As_2O_3. The increased killing power is mainly due to the increased wetting power resulting from the addition of an emulsion. The tick does not obtain a lethal dose from arsenic present in the circulating blood, but from that present on the skin of the host. To prevent reinfestation, dipping must be repeated at short intervals; injury to the stock is avoided by reduction in the concentration of the dipping bath. It is then found that at the reduced strength, although a single dipping fails to kill all the ticks, repeated dippings render the host poisonous to all ticks, both those attached at the time of dipping and those which may be picked up later. The conclusion is reached that the arsenic is cumulative in its action and the quantity absorbed by the skin is augmented until a certain maximum is reached. Arsenical solutions applied to the skin penetrate the cellular tissues by osmosis and it is presumed that the arsenic enters into combination with some organic constituent of the cells. About 5·4 grams of arsenic are applied to the skin at each dipping. The lethal dose for cattle varies from 15 to 30 grms. and it follows that quantities of arsenic which would prove fatal if applied internally, may be safely applied to the skin. The epidermal cells possess an affinity for arsenic and as soon as this affinity is satisfied, the excess is available for absorption by the blood. If dipping is repeated at frequent intervals, the amount of arsenic present in the blood of the peripheral vessels of the skin must be considerable. In the case of diseases transmitted by external parasites, the infective organisms can only be injected into the most peripheral cutaneous capillaries, where the concentration of arsenic is great enough to kill them. Such being the case, regularly dipped animals on infected pastures would remain free from disease. This hypothesis was shown to be correct at Elliotdale, where 500 head of cattle remained free from disease for a period of 18 months. It remains to be ascertained for how long, after ceasing to dip, cattle will remain immune to East Coast fever when on infected pasture. It is possible that they will not act as carriers for several days after dipping. If this point could be proved, it would be possible to relax the present system of quarantine so as to allow some movement of stock. If by dipping, the amount of arsenic which can be introduced into the peripheral vessels is sufficient to kill ticks, it is possible that it might kill other blood-sucking insects, such as tsetse-flies. The natural infection of stock by tsetse-flies should be also preventible by the same means, and as regards trypanosomiasis, it is highly probable that dipping would exert a pronounced effect. Preliminary investigations have been made in this direction. The results of the various experiments performed are recorded in tabular form.

WILLIAMS (C.). **The Chemical Control of Cattle Dipping Tanks.**—*South African Journal of Science, Cape Town*, xi, no. 8, May 1915, pp. 287–296. [Received 21st October 1915.]

The bulk of this paper consists of a recapitulation of previous work [see this *Review*, Ser. B, ii, p. 181] on the effect of the addition of various substances to the dip on its relative content of arsenite and arsenate. Several different sodium arsenites are known, including acid sodium arsenite ($Na_2O_2As_2O_32HO$), prepared by dissolving arsenious oxide in a solution of sodium hydrate or sodium carbonate, and evaporating the solution, which contains 80·2 per cent. of arsenious oxide; sodium metarsenite ($Na_2OAs_2O_3$ or $NaAsO_2$), formed by boiling the previous compound for some time with sodium carbonate, and washing the residual salt with alcohol; this contains 76·2 per cent. of arsenious oxide; sodium pyro-arsenite ($Na_2O2As_2O_3$) is produced when sodium carbonate is fused with an excess of arsenious oxide and theoretically should contain 86·5 per cent. of arsenious oxide. The commercial arsenite of soda recommended by Watkins-Pitchford in the "Laboratory" formula is stipulated to contain 80 per cent. of arsenious oxide, and the brands sold in South Africa are usually guaranteed to come up to that standard. These commercial varieties probably contain a mixture of the above-mentioned sodium arsenites in varying proportions. A large number of samples of arsenite of soda have been analysed in the laboratory at Cedara during the past few years, and the arsenic content has ranged from 50·7 per cent. to 82·6 per cent. Some arsenic oxide (As_2O_5) is also invariably present, but the amount is generally comparatively small. Seeing, therefore, that the composition of the substances sold as arsenite of soda is so variable, a purchaser should insist on a warranty being submitted with each consignment, and should also send a representative sample to an independent analyst for analysis. The dip fluid in the tank should be submitted for analysis immediately it is made up, before any stock is put through and also at frequent intervals afterwards. The need for this is advocated for the following reasons:—The varying composition of the arsenite of soda employed; the serious errors that are liable to occur in weighing out the arsenite of soda or in measuring the amount of other proprietary dips that may be used; the difficulty encountered in measuring the exact volume of water added to the tank; the constant evaporation of water that takes place from the tank, and, on the other hand, the occasional flooding by storm water; the chemical change that takes place in the composition of the arsenical compounds in the tank.

MALLY (C. W.). **Notes on the Use of Poisoned Bait for Controlling the House-Fly,** *Musca domestica*, **L.**—*S. African Jl. of Science, Cape Town*, xi, no. 9, June 1915, pp. 321–328. [Received 21st October 1915.]

The importance of anything which can be used as manure in South Africa is such, that its destruction as a means of preventing flies from breeding in it is out of the question. Manure repositories have been tried and, as is now well known, the heat of the fermenting mass drives the maggots to a surface layer 1½ to 3 inches deep, in which they can be handled by chemical methods. If however the work of piling and levelling the manure is done in a slovenly manner, the method fails in consequence of the migration of the maggots to cooler portions of the heap. The alternative to careful work is to regard the repository as a huge fly-trap, screen all openings and kill the flies as they emerge or enter. The great difficulty of this method is the expense, though the manure being thoroughly protected from the weather, is greatly increased in value. No relief however is afforded in respect of flies from breeding places which for any reason are beyond control. The systematic and regular use of poisoned bait has proved very satisfactory, but arsenate of lead, which acted quickly enough for the purpose in fruit-fly work, is too slow against house-flies, and arsenite of soda was much more effective. The usual method of use by exposing it in plates or other receptacles was dangerous to children and animals, and it could not be used on living plants because of its destructive action. A convenient vehicle for the bait was therefore desirable, and branches of trees having firm foliage which, though it withers, does not easily drop, serve the purpose well. Branches of eucalyptus were used on a farm on which the experiments were carried out, and these were syringed with a mixture of 1 lb. arsenite of soda and 2 gallons of treacle in 10 gallons of water; the results were excellent. When the method was tried in Cape Town, branches of *Acacia cyclopis* were particularly suitable, as also were various articles of rubbish, such as pots, tins, bottles, etc., almost anything in fact with a smooth non-absorbent surface which preserves the efficiency of the bait for many days; the results were again excellent. For house work, a mixture of 1 lb. arsenite of soda, 10 lb. cheap sugar and 10 gallons of water was adopted and worked well. At an Agricultural School where the fly pest was serious, manure containing a large proportion of straw and other coarse litter was sprayed with fair success, but the branch method proved much better. As a rule, wherever citrus trees thrive in South Africa, flies will breed almost all the year round and baiting should therefore be more or less continuous even in cold weather. During the mobilisation of the Union Government forces, flies threatened to become a plague in the camps; spraying parts of the tents frequented by the flies was found useful; where the soil was coarse and stony on the surface the bait was found to do good when sprayed over it. When manure heaps have to be sprayed more or less indiscriminately, there is a good deal of waste and the manure is damaged for agricultural purposes, but with reasonable care and the use of branches laid over the heap the percentage of arsenic in the manure is negligible. It is stated that the bait method is very much cheaper than any other with which the author is acquainted.

DE CHARMOY (D. D'E.). **Report of the Division of Entomology.**—*Ann. Rept. Dept. Agric., Colony of Mauritius, for 1914.* [Received 18th October 1915.]

A poultry-run infested with *Echidnophaga* (*Sarcopsylla*) *gallinacea* was sprayed with kerosene and phenyl mixture 1 per cent., and this controlled the pest. The following ticks have been collected from all parts of the Island:—*Amblyomma variegatum* on deer, cattle and goats; *Rhipicephalus sanguineus* on cattle and dogs; *R. evertsi* on cattle and dogs; *Margaropus annulatus* var. *decoloratus* and *Amblyomma* sp. on cattle and *Argas persicus* on fowls. One dipping tank has this year been constructed at St. Antoine estate at a cost of Rs. 200. The results have been most satisfactory. Ticks have decreased in numbers and the general condition of the cattle has improved.

Stott (Capt. H.). **Studies in Malaria.**—*Indian Med. Gaz., Calcutta*, xlix, no. 12, December 1914, pp. 462–471; l, nos. 1–6, January-June 1915, pp. 7–10, 47–52, 85–91, 131–135, 172–175, 213–217; 13 figs., 3 plates, 34 charts, 2 plans.

At Fort Dufferin, Mandalay, the conditions favour the presence both of mosquitos and malaria. Mosquitos are abundant throughout the year and their breeding places are described in detail. In July, *Anopheles culicifacies* and *A. rossi* were predominant, while in December, *A. fuliginosus*, *A. sinensis* and *A. barbirostris* are the only species met with.

Administrator's Proclamation no. 11 of 1915.—*Prov. of Natal Off. Gazette, Pietermaritzburg*, no. 306, 19th August 1915.

This proclamation abolishes the close season in respect of reedbuck, waterbuck, kudu, wildebeeste, buffalo, zebra, bushbuck, duiker, and steinbuck, as regards certain defined areas. The game may be killed or destroyed within the specified areas subject to the ordinary game license. It is further notified that in cases where it is shown to the satisfaction of the Administrator that there is danger of the spread of nagana, permits will be issued, without payment of the prescribed charges, to European farmers and settlers residing in the area of Zululand lying south of the White Umfolozi River to its junction with the Black Umfolozi River, and thence south of the Umfolozi River to the Indian Ocean (excluding the Dukuduku Game Reserve), and in the European settlement lying immediately north of the Umfolozi River, to kill any of the above game within the boundaries only of their respective farms or holdings.

Breijer (H. G.). **Notes on the Maputaland Expedition (27th May to 3rd July 1914).**—*Ann. Transvaal Museum, Pretoria*, vol. 5, 28th August 1915, pp. 111–115, 1 fig.

The objects of this expedition were to investigate animals infected with trypanosomiasis and to obtain information about blood-sucking Diptera, especially Tabanidae and *Stomoxys*. The results in connection with blood parasites were negative. No Tabanids were found; all the Diptera collected belonged to the Muscidae, Trypetidae, and Culicidae. The following ticks were collected from rhinoceros: *Rhipicephalus simus*, *Dermacentor rhinocerotis*, and *Amblyomma petersi* A tick belonging to the genus *Ixodes* was found on *Dendraspis angusticeps* (black mamba).

Siler (J. F.). **Medical Notes on Barbados, British West Indies. Part I: General Information concerning Barbados; its Prevailing Diseases. Part II: Pellagra in Barbados.**—*Amer. Jl. Trop. Dis. & Prevent. Med., New Orleans*, iii, nos. 1 and 4, July and October 1915, pp. 46–63 and 186–221, 1 plate, 1 chart.

The decrease of elephantiasis in the Island of Barbados is attributed by the medical officers there to the mosquito work initiated for the extermination of *Stegomyia fasciata* (*Aedes calopus*) during the yellow fever epidemic in 1908. *Culex fatigans* (*quinquefasciatus*) is found throughout the island, but its breeding places have been controlled in the fight against *S. fasciata*. The measures must however be continued if filariasis is to be exterminated. In connection with the presence of pellagra, *Stomoxys calcitrans*, *Musca domestica* and midges (*Culicoides*) are all stated to occur in the island.

ZETEK (J.). **Behaviour of** ***Anopheles albimanus*****, Wied., and** ***tarsimaculata*****, Goeldi.**—*Ann. Entom. Soc. America, Columbus, Ohio*, viii, no. 3, September 1915, pp. 221–270, 6 figs.

Anopheles albimanus and *A. tarsimaculatus* are the most important species of mosquitos concerned in the transmission of malaria in the Canal Zone. The study of the behaviour of mosquitos is important to the sanitary inspector, in that it gives him clues as to the measures to adopt, the areas to control, and the best sites for temporary or permanent camps. Wind, temperature and humidity are the most important factors in the environment of the adult mosquito. The winds at Gatun are relatively high, but they die down considerably at dusk. The general mean temperature of the Isthmus of Panama is about 80 F. The average annual rainfall for Gatun for the past nine years has been 129·3 inches. The rains usually fall during the afternoon; thunder-storms and violent rains are rare. The salinity of the water tested equalled that of the ocean, but did not inhibit breeding. Ordinarily, the water of the salt marsh is greatly evaporated as the dry season advances and its salt content is so increased that mosquito larvae cannot live in it. An increase of rains occurred during the latter part of 1912, whereby the water of the marsh was so diluted that subsequent evaporation did not increase the salt content beyond the critical point. The life-cycle of *A. tarsimaculatus* was found to occupy from 7 to 9 days. Larvae and pupae were frequently associated with green algae. In the laboratory, change from fresh water to the salt water of the marsh accelerated pupation. The adults were most active at dawn and dusk. Direct observations from boats and on land showed a distinct flight of *A. tarsimaculatus* and *Ochlerotatus* (*Aedes*) *taeniorhynchus* towards Gatun, beginning at dark and lasting from 30 to 45 minutes. There was a return flight from Gatun to the breeding place beginning at early dawn and lasting about 30 minutes. The return flight took place higher in the air and was more rapid. The flight to Gatun was experimentally proved by liberating marked mosquitos at the swamp and later recovering them at Gatun. Pairing probably takes place on the return flight. More males were found near the marsh during the return flight than during the evening flight. Mosquitos were found to hide during the daytime under buildings in Gatun, a low estimate placing the number of *A. tarsimaculatus* in such positions at 10,000 per day. Both *A. tarsimaculatus* and *O. taeniorhynchus* exhibited extreme voracity and continued to suck blood although placed in direct sunlight.

NEIVA (A.). **Presença em uma localidade do Estado do Rio de um novo transmissor da "Molestia de Chagas" encontrado infectado em condições naturaes. (Nota prévia.)** [Occurrence in a locality in the State of Rio of a new carrier of Chagas' disease found infected under natural conditions.]—*Brazil-Medico, Rio de Janeiro*, xxviii, no. 35, 15th September 1914, pp. 333–335.

An example of *Triatoma vitticeps*, Stål, has been found to be naturally infected with *Trypanosoma cruzi*. This new carrier of Chagas' disease is the largest blood-sucking insect attacking man. The presence of Chagas' disease in a locality may be diagnosed with more certainty by examination of the intestinal contents of *Triatoma* than in any other way. The State of Espirito Santo appears to be the chief habitat of the species.

NEIVA (A.). **Contribuição para o conhecimento dos hemipteros hematophagos da America Central. (Nota prévia.)** [A contribution to the knowledge of the blood-sucking Hemiptera of Central America.]—*Brazil-Medico, Rio de Janeiro,* xxix, no. 1, 1st January 1915, pp. 1–3.

The author received from Dr. L. E. Hurtado of the Republic of San Salvador a number of examples of *Triatoma dimidiata*, Latr., var. *maculipennis*, Stål, and *Rhodnius prolixus*, Stål, together with the information that he had found *T. dimidiata* infected with crithidial forms of *Trypanosoma cruzi*, and had infected guineapigs and rabbits after 25 days of incubation. Besides *T. dimidiata*, *T. rugulosa*, Stål, is found in Costa Rica, *T. venosa*, Stål, in Costa Rica and Panama, and *T. rufotuberculata*, Champion, in Panama.

LA-PUENTE (T.). **Paludismo en la costa del Perú. Etiologia, Formas Clinicas, Profilaxis.** [Malaria on the coast of Peru. Etiology, Clinical Forms, Prophylaxis.]—*Memoria presentada al V Congreso Médico Latino-Americano, Lima,* 1914, 69 pp.

In this memoir to the 5th Latin-American Medical Congress, it is stated that the period of prevalence of malaria in Peru varies with the time of the year and is not coincident with the period of maximum prevalence of mosquitos. Near Lima, most cases of malaria occur from January to June, while mosquitos are most abundant in the remaining six months, which are dry and cool. *A. superpictus*, or a variety of this species, is the mosquito chiefly met with.

SALM (A. J.). **Over het vernietigen van muskieten en muskietenlarven.** [On the destruction of Mosquitos and Mosquito larvae.]—*Geneeskundig Tijdschr. v. Nederl. Indië, Batavia,* lv, no. 2, pp. 173-179.

The addition of 1 : 3,200 of lysol was found to kill the mosquito larvae in tubs in a hospital. The addition of 1 : 5,000 of copper sulphate, with sufficient sulphuric acid to prevent precipitation, also kills the larvae, but does not prevent them from hatching. Copper sulphate moreover does not communicate a taste to drinking water which may be subsequently kept in the containers, while lysol fails in this respect.

GALLI-VALERIO (B.) & ROCHAZ DE JONGH (Jeanne). **Studi e ricerche sui culicidi. 10ª Memoria.** [Studies and research on the Culicidae.] —*La Malariologica, Naples,* viii, nos. 1–2, 15th April 1915, pp. 9–11.

This paper summarises observations made from October 1912 to October 1913 near Orbe, Canton of Vaud, Switzerland, and at Sondrio, Valtellina. Near Orbe, larvae of *Anopheles nigripes* were found on

17th September at an altitude of 2,900 feet above sea-level in a small cavity in *Abies pectinata*. Larvae and nymphs of *C. pipiens*, *C. nemorosus* and *Theobaldia annulata* abounded in ditches from 20th October to 3rd November; larvae of *Anopheles bifurcatus* were found at the same time. The larvae of *Culex* were exceedingly abundant during the winter, those of *Anopheles* being less numerous. On 1st January 1914, larvae of *C. nemorosus* were found in woods in pools covered with ice 0·4 inch thick. On 26th April 1913, nymphs of *C. nemorosus* and *C. cantans* were numerous in the ditches; the first nymphs of *A. bifurcatus* only appeared in May. *T. annulata* was observed to bite man from 24 hours to five days after emergence.

RODHAIN (M. J.). **Sur la biologie de *Stasisia rodhaini*. Gedœlst** (*Cordylobia rodhaini*). [On the biology of *Cordylobia rodhaini*, Gedœlst.]—*C. R. hebdom. Ac. Sci.*, *Paris*, clxi, no. 11, 13th September 1915, pp. 323–325.

The larva of *Cordylobia* (*Stasisia*) *rodhaini* causes cutaneous myiasis in the damp forest regions of equatorial Africa. As in the case of *C. anthropophaga*, man only forms an accidental host of this species, which seems to attack thin-skinned mammals inhabiting the forest regions. In the district of Welle, the hosts are the duiker antelopes, *Cephalophus dorsalis* and *C. grimmi*, and a rodent, *Cricetomys gambianus*, Wat. Dogs and the small cattle of the natives appear to be immune. The eggs are deposited on the ground in places frequented by the host, and after hatching, the young larvae pass on to its skin, which they at once penetrate. An essential condition of infestation appears to be the immobility of the host. Adults have been reared from the larva and were fed on the excreta of dogs or chimpanzees, or liquid vegetable sugar. In captivity, the flies remained motionless during the day, but were extremely active at night. One female kept under observation lived from the 28th September until 28th October, during which time 503 eggs were deposited. The period of incubation of the egg varies from two to four days. The complete development of the larva requires from 12 to 15 days, starting from the time of penetrating the skin of the host. Mature larvae leave the host, pass into the ground to a depth of from 1½ to 3 inches, and pupate in from 12 to 48 hours. The pupal stage lasts from 23 to 26 days, and a certain amount of moisture is necessary. The total life-cycle occupies from 57 to 67 days.

ZUCKER (A.). **Zur Bekämpfung der Kleiderläuse.** [Towards combating clothes lice.]—*Centralbl. f. Bakt., Parasit. u. Infektionskrankheiten, Jena*, lxxvi, no. 4, 28th June 1915, pp. 294–303, 18 figs.

This study of *Pediculus humanus* (*vestimenti*) was made at the camp for prisoners-of-war at Königsbrück, where 9,000 Russians were interned. At 10° F. the louse becomes rigid with cold, but revives when the temperature rises again. The statement that lice die at 94° F. is incorrect, but dry heat, at 104° F., will kill a gorged louse in six hours or a hungry one in two hours, with correspondingly quicker results at higher temperatures. In combating lice with strong smelling substances, the obstruction of the tracheae appears to be most effective.

The chitinous covering of the egg seems very impervious to water evaporation or chemical action, but not to high temperatures, which are therefore the most certain means of killing both lice and their eggs.

Galli-Valerio (B.). **Parasitologische Untersuchungen und parasitologische Technik.** [Parasitological researches and technique.]—*Centralbl. f. Bakt., Parasit. u. Infektionskrankh., Jena*, lxxvi, no. 7, 25th August 1915, pp. 511–518.

Acarids of the genus *Glyciphagus* were found to be present in hay and straw in the canton of Valais, where soldiers, using these materials, had suffered from itching, thus corroborating Hering and Murray's observation of these Acarids. The author has also noticed that Alpine climbers suffer in the same way after sleeping on hay. Up to now, *Psoroptes communis* on the rabbit had only been found in the outer ear, but an instance is recorded of a rabbit, the lips and toes of which were attacked by *Sarcoptes minor* and *P. communis*. Experiments in the resistance to starvation of ticks are recorded. A nymph of *Ixodes ricinus* lived for two months on water and a little sugar; of 150 *Argas persicus*, 13 died after eight months, 136 after 11½, one after 13, nine after 16½, one after 20½ and two after 22½; they had previously been allowed to suck blood from fowls. Specimens of *Pediculus capitis*, De Geer (*cervicalis*, Leach), which were kept in test-tubes, died after 12 hours at 36° C. and after three days at 20° C. In a woman's hair, cut off and placed in a container at 20°, some of the lice died after six days.

Sikora (H.). **Beiträge zur Biologie von** *Pediculus vestimenti.* [Contributions to the biology of *Pediculus vestimenti.*]—*Centralbl. f. Bakt., Parasit. u. Infektionskrankh., Jena*, lxxvi, no. 7, 25th August 1915, pp. 523–537.

In his researches on the biology of *Pediculus humanus* (*vestimenti*), the author endeavoured to work under natural conditions, carrying on his person, day and night, a small box containing glass receptacles in which the lice were confined by plugs of cotton wool. Twice daily, they were fed on the forearm or on the back of the hand. To confine them to the chosen spot, the skin around it was greased with vaseline and it was found that individuals which became completely covered with vaseline were quite unaffected, even 12 hours later. The lice were subsequently kept in glass tubes 2 cm. long, of which one end was plugged with cotton wool and the other closed with silk gauze. For the purpose of feeding them, these tubes were placed in holes in a piece of wood which was then strapped to the forearm. According to Warburton, the third moult is followed by an inactive stage of four days, but the author considers that this must be due to the feeding not having been done sufficiently carefully. Underfed or cold lice do not oviposit. In one case mating took place 10 hours after the third moult and the first eggs were laid by the first three batches within 24–48 hours. It is not probable that eggs are laid on straw bedding under natural conditions, as oviposition ceases at 76° F. and a daily fall of temperature to 61° F., even though it lasted for two hours only, caused a considerable reduction in the number of eggs. It is probable that hatching and oviposition will be stopped if, at night, all clothes are taken off and placed where the temperature is under 61° F. and all bedding is left during the day in an unheated place. Eggs hatched normally when kept in small covered glass dishes, without any special precaution. At 94° F., which appears to be the optimum temperature for all stages, hatching occurred after 144 hours; the eggs were killed at higher temperatures. They appear to be very hygroscopic, so that steam laden with a poison might be used to destroy them. At a distance of 1 or 2 cm., the human skin usually attracts the lice, but at 3 cm. the attraction is doubtful.

This paper closes with a few notes on *Haematopinus suis* (swine louse) which seems a suitable species for experimental work. A bibliography of eight works is added.

Penschke (—). **Prophylaxe gegen Sandflöhe.** [Prophylaxis against chiggers.]—*Arch. f. Schiffs- u. Trop. Hyg., Leipzig*, xix, no. 5, March 1915, pp. 150–151.

Against *Dermatophilus penetrans* 15 drops of lysol or cresol soap solution are mixed with 3½ oz. of vaseline, and this is rubbed into the feet after they have been washed. Protection has thus been obtained against chiggers for at least three days, even in badly infested districts. Chiggers which have already entered the skin are quickly killed and are easier to remove than when alive. This method was reported on from various parts of German East Africa, but not always favourably. Non-success may be due to the application not having been made at bed-time—when the preparation would have time to permeate the tissues. One of the unfavourable reports stated that efficiency was only obtainable if the application was a daily one.

Eysell (A.). **Nachtrag zu "Eine infaches Vorbeugungsmittel gegen Verlausung und ihre Folgen."** [A further note on a simple preventive against louse-infection and its results.]—*Arch. f. Schiffs- u. Trop. Hyg., Leipzig*, xix, no. 8, April 1915, pp. 238–240.

Precipitated sulphur, which is recommended against lice, is an extremely fine amorphous powder which does not cause irritation of the skin, as is the case when the crystalline flowers of sulphur is used. Colloidal sulphur presents no additional advantage and is very much dearer. Sulphur ointments are uncomfortable, soil the clothes and do not act within the clothes in which the lice hide. Brushing is the simplest means of applying the powder. In the case of individuals who perspire freely the effect lasts about a fortnight; in normal cases, about a month.

Wesenberg (G.). **Zur Bekämpfung der Läuseplage.** [Towards combating the plague of lice.]—*Deutsche Med. Wochenschr., Berlin*, xli, no. 29, 15 July 1915, pp. 861–862,

The author states that anisol has now been discarded by the Austrian authorities. He himself experimented with it and prefers either cyclohexanone, $C(CH^2)^5CO$, alone or with cyclohexanol, $C(CH^2)^5.CHOH$. For use, inert powders are impregnated with these substances.

STANTON (A. T.). **The Larvae of Malayan** *Anopheles*.—*Bull. Entom. Research, London*, vi, no. 2, September 1915, pp. 159-172, 15 figs.

The mature larvae of the following Malayan Anophelines are described: *Anopheles aconitus*, Dön., *A. aitkeni*, James, *A. asiaticus*, Leic., *A. barbirostris*, Wulp, *A. fuliginosus*, Giles, *A. karwari*, James, *A. kochi*, Dön., *A. leucosphyrus*, Dön., *A. maculatus*, Theo., *A. rossi* var. *indefinitus*, Ludl., *A. sinensis*, Wied., *A. tessellatus*, Theo., *A. umbrosus*, Theo. A key to the known mature larvae of Malayan Anophelines is given.

HIRST (S.). **On Some New Acarine Parasites of Rats.**—*Bull. Entom. Research, London*, vi, no. 2, September 1915, pp. 183-190, 8 figs.

The new mites, parasitic on rats, which are described in this paper, are: *Laelaps nuttalli*, from Colombo, on *Mus rattus* and *M. norvegicus*; from Calcutta, on *Nesokia* (*Gunomys*) *bengalensis* and *M. rattus*; from Freetown, Sierra Leone, on *M. rattus*; from Dutch Guiana, on *M. norvegicus*. *Microthrombidium gliricolens*, from Calcutta, found in the inner part of the ear of *M. rattus*. *Schöngastia indica*, from Calcutta, on *Nesokia bengalensis*. *Schöngastiella bengalensis*, gen. et sp. n., from Calcutta, in the inner part of the ear of *M. rattus*. Central Formosa is given as an additional locality for *Dermanyssus muris*, Hirst.

KING (H. H.). **Preliminary Notes on the Life-History of** *Argas brumpti*, **Neumann.**—*Bull. Entom. Research, London*, vi, no. 2, September 1915, pp. 191-193.

Argas brumpti has been collected in Somaliland, British East Africa, and the Anglo-Egyptian Sudan. In the last-named province, specimens were taken at Gebelein in 1909 and again in August 1913 from crevices between rocks and in caves, where the ticks live among soil and rotting leaves and twigs. No difficulty was experienced in inducing them to feed on man or a rabbit, even when exposed to strong light. An adult female was given human blood on 21st August, but afterwards was fed on rabbits. Eggs were obtained in March and April 1914, but efforts to rear the resulting larvae failed. A further supply of eggs was obtained in October 1914, from nymphs collected at the same time which had reached the adult stage. Pairing apparently takes place at night. The ticks were confined in glass-bottomed pill-boxes containing a little dry sand, in which the eggs were deposited. If undisturbed, the female continued to brood the eggs until hatched. In one case the incubation period was 26 days. The larvae do not feed readily until about 10 days old. Those under observation attached themselves promptly to a nestling sparrow and pigeons, but after becoming partially gorged on these hosts they died, without dropping off. Efforts to feed the larvae on adult sparrows, wild doves and bats were not successful. Guineafowls proved suitable hosts, the larvae becoming attached round the ear and on the upper part of the neck. Nineteen larvae attached themselves on 13th December 1914 and 30 more two days later; 26 were recovered between 21st December and 1st January. These larvae were fed on rabbits and at the time of writing had moulted 4 times. Further details of the life-history are being secured.

DRAKE-BROCKMAN (R. E.). **Some Notes on the Bionomics of** *Ornithodorus savignyi* **in British Somaliland.**—*Bull. Entom. Research. London*, vi, no. 2, September 1915, pp. 195–196.

In Somaliland *Ornithodorus savignyi* is found in the soil in or around the huts on the outskirts of coastal towns, especially in the more squalid and insanitary areas. In the interior it frequents most camps of long-standing inhabited by man and domestic animals. The ticks are extremely common in the dusty soil surrounding wells and waterholes. *O. savignyi* is capable of living for months in the soil without feeding on blood ; it burrows to a depth of from half to one inch, lying dormant until the ground is disturbed by man or beast. Man, camels, cattle, ponies, mules, sheep and goats are equally attacked. It seldom climbs higher than the ankles in man and the hocks in animals. The time required for a blood meal varies from 20 to 60 minutes. As soon as it is engorged with blood and before withdrawing the biting apparatus, the tick discharges a fluid through the anus which moistens the skin in the vicinity of the puncture. This fluid is the cause of subsequent irritation, which varies in different individuals. Various methods suggested for destroying the ticks have little practical value owing to their wide distribution. In confined areas, such as the vicinity of wells, the best and cheapest method to adopt is to cover the whole infested area with dry grass and brushwood, after harrowing the surface, and then setting fire to the grass all round simultaneously, so that the fire will burn towards the centre. Spraying with antiseptics is useless, since a two-hours' immersion of immature and full-grown ticks in solutions of 1 in 500 carbolic acid and corrosive sublimate failed to destroy them. Immersion in a 5 per cent. solution of lysol for half an hour caused the death of some of the ticks. If *O. savignyi* is touched with a drop of turpentine it dies at once. The author has taken advantage of this fact to recommend all native soldiers with bare feet, when entering a locality where the ticks swarm and are infected with the spirochaete of relapsing fever, to rub their feet and ankles with turpentine. This is considered to be a useful prophylactic measure.

LUDLOW (C. S.). **The Synonymy of** *Anopheles christophersi*, **Theo., and** *A. indefinita*, **Ludl.**—*Bull. Entom. Research, London*, vi, pt. 2, September 1915, pp. 155–157.

This paper is intended to correct the synonymy of these two species of *Anopheles*. According to Edwards, *Myzomyia funesta*, Giles, and *M. flavirostris*, Ludl., are both identical with *Anopheles christophersi*, Theo. Banks has recently described the species as *A. febrifer* [see this *Review*, Ser. B, iii, p. 65]. A note by Mr. F. W. Edwards states that the name which has priority is *A. minimus*, Theo.

With regard to *Anopheles rossi* var. *indefinita*, Ludl., Edwards now states that the view that the true *rossi* does not occur further east than India and Ceylon is no longer tenable. He has seen examples of *A. rossi* from the Philippines and of the var. *indefinita* from Bengal.

LUDLOW (C. S.). **A Question of Synonymy.**—*Military Surgeon, Chicago*, xxxvi no. 6, June 1915, pp. 505–508.

This note discusses the same questions as those in the foregoing paper.

HUTCHINS (E.). **Annual Report of the Veterinary Division.**—*Uganda Protectorate; Ann. Rept. Dept. Agric. for the year ending 31st March 1915, Kampala,* 1915, pp. 44–52. [Received 8th October 1915.]

A serious outbreak of trypanosomiasis amongst the transport cattle at Kampala occurred during the year. The identity of the transmitting agent was not solved. Hitherto *Stomoxys* had been by far the most common fly; *Haematapota* were very prevalent after the rains began, but *Tabanus* were not brought in in any numbers. *Glossina palpalis* was taken, though not within 2½ miles of Kampala. It is considered probable that the cattle which were found infected with trypanosomes of the *T. vivax* and *T. uniforme* type had been exposed to the bites of *G. palpalis.* There has been a very marked increase of *G. morsitans* in Southern Ankole. Cattle, sheep, goats and dogs were all found to be infected. The trypanosome most commonly met with was *T. pecorum* in cattle and a trypanosome of the *T. vivax* and *T. uniforme* type in sheep and goats.

In Appendix I. to this Report, Mr. U. F. Richardson gives details regarding the outbreak of trypanosomiasis. Fifty-two cattle were placed under 9 various treatments, of which orpiment used alone gave the best results. The dose was 8 grammes to 12 grammes, depending on the size of the individual, the weight of an average animal being estimated at about 400 lb. Relapses, however, occurred in every case, and continuing the dose every other day seemed to have no effect in preventing them.

HADLINGTON (J.). **Poultry Notes.**—*Agric. Gaz. of New South Wales, Sydney,* xxvi, no. 9, September 1915, pp. 805–807.

A species of tick known as the "sucking louse" is often found infesting the heads of chickens which are being brooded with hens. The first sign of infestation is the drooping of the wings. The tick may be got rid of by brushing the head and throat with salad oil; stronger applications, such as kerosene or caustic substances, will injure the birds. The treatment should be carried out on a warm day, and should be repeated after 8 or 10 days. This species is distinct from *Argas persicus* (the fowl tick) and only seriously affects young chickens up to 10 weeks old.

SERGENT (Edm.), SERGENT (Et.), LEMAIRE (G.) & SENEVET (G.)—**Hypothese sur le Phlebotome "Transmetteur" et la Tarente "Reservoir de Virus" du Bouton d'Orient.** [The hypothesis that *Phlebotomus* is the carrier and the Algerian Gecko the reservoir of the virus of Oriental Sore.]—*Ann. Inst. Pasteur, Paris,* xxix, no. 7, July 1915, pp. 309–322.

Stegomyia fasciata is not found at Biskra and bed-bugs do not appear to be incriminated; on the other hand, Biskra boil is contracted in the autumn, and this is precisely the season in which *Phlebotomus* abounds. The Arabs call the disease the date boil, indicating the coincidence of its prevalence with the ripening of the dates in September. The lesions are almost always on exposed parts of the body and a considerable number may occur on one individual; both these facts are consistent with the attacks of a winged insect and especially of *Phlebotomus*. The authors raise an objection to their own theory, namely, that in Algeria the disease is only known in Biskra, whereas *Phlebotomus* swarm all over the North of Africa and have been specially studied in places where the malady was thought to be quite unknown. It is now believed to be far more widespread than was supposed, and a list of widely separated places is given, in which Oriental sore is known to exist. In order to explain why all areas where *Phlebotomus* occurs are not infected with oriental sore, two hypotheses are put forward, (1) the existence in certain places only of a reservoir of *Leishmania tropica* and (2) the aptitude of certain species only of *Phlebotomus* to transmit the disease. Man himself cannot be considered the reservoir, nor, in spite of Gonder's researches, can the disease be considered as one of the general system. The number of organisms circulating in the peripheral blood is hardly sufficient to infect biting insects and these never settle on, or feed upon, the sores; even other flies can hardly be regarded as carriers, because the exudations from the sores contain but very few Leishmania bodies and no biting insects would attack the hard crust at the edges of the sore where these bodies are very numerous. The reservoir must therefore be sought amongst animals capable of being bitten by *Phlebotomus*. Lutz and Neiva have remarked that horses in desert places in Brazil are more frequently bitten than their riders; Roubaud found *P. minutus* var. *africanus* living in swarms in company with a lizard, *Agama colonorum*, biting it without apparently causing great annoyance; Howlett has recorded the gecko as the natural host of *P. minutus* [see this *Review*, Ser. B, i, p. 211]. According to Townsend, in South America *Phlebotomus* will bite almost any warm-blooded animal, as well as reptiles; Schannon and Bartsch have seen *P. vexator* biting snakes in Maryland and Virginia; and Roubaud has lately noted *P. minutus* var. *africanus* attacking a captive python in Senegal, and he regards these insects as specially attacking reptiles. *P. papatasii* and its congeners, on the other hand, specially affect man, and *P. minutus* also attacks the Algerian gecko, *Tarantola mauritanica*. Howlett has shown that the distribution of *P. minutus* coincides with that of the geckos, and it may be further said that the distribution of Oriental sore is the same. The Algerian gecko is common in all the houses in Biskra and three species of *Phlebotomus* are found there, viz.: *P. papatasii*, Scop., *P. perniciosus*, Newst., and another species which is regarded as identical with *P. minutus*, Rond., var. *africanus*, Newst. Cultures of the organs of the gecko have yielded bodies closely resembling, if not identical with, the leptomonads of Oriental sore. At Beni-ounif-de-Figuig, where the disease is unknown, *Phlebotomus* is very abundant, but of 203 insects captured, 202 proved to be *P. papatasii* and only one *P. minutus* var. *africanus*; six geckos examined yielded leptomonads resembling those found in the geckos of Biskra. Other comparative studies have been set on foot at various places and will be continued when circumstances permit.

Renault (Jules). **Mésures prophylactiques contre le Typhus Exanthematique et le Typhus Récurrent.** [Prophylatic Measures against Exanthematous and Recurrent Typhus.]—*Paris Med.*, 1915, 24th July, vol 5, nos. 11–12, pp. 206–212.

The method recommended for treating persons infected with lice is described. The patient strips in one room and enters another in which he is treated. The whole of his clothing is put into a metal box, sprayed with 40 to 50 cc. of benzine and the lid closed; all lice are killed in from 15 to 20 minutes. Cotton garments are boiled in a 5 per 1,000 solution of carbonate of soda for 10 minutes; woollen clothing is disinfected by heat or fumigation with sulphur. The patient's hair is removed if he be badly infested and his body well rubbed over with one of the following preparations, special care being given to the head, beard, axillae, etc.:—Camphorated oil (10 per cent.); oil of turpentine (15 per cent.); camphorated spirit (10 per cent.); chloroform water (5 per 1,000); a mixture of equal parts of oil and petrol; 90 drops of xylol mixed with 30 grammes of vaseline; a solution of anisol (anisol 5 cc., 90 per cent. alcohol 50 cc., water 45 cc.). Benzine may be applied on the head under a bonnet or on the body under a cloak. Grey ointment is especially used for the treatment of *Phthirius pubis.* It is advisable to restrict its use to the pubic and axillary regions and to wash off all ointment two hours after application. Vaseline mixed with yellow precipitate in the proportion of 1 in 50 is advised for the treatment of *P. pubis* in the eyelashes and eyebrows. This does not destroy the eggs and the treatment must be persisted in daily for a week in order to kill the lice as they hatch out.

Orticoni. **Prophylaxie du Typhus Exanthematique. Procédé de Destruction Rapide des Poux de Corps.** [Prophylaxis against Exanthematous Typhus. Method for the rapid destruction of body lice.]—*Paris Med.*, 1915, 17th April, vol. 4, no. 49–50, pp. 480–481.

A 10 per cent. solution of formalin sprayed over the clothing is advised as the best means of killing body lice and their eggs. Death is said to take place in a few minutes and the method has the advantage of not harming the clothing in any way.

Illingworth (J. F.). **Notes on the Habits and Control of the Chicken Flea** (*Echidnophaga gallinacea*, **Westwood**).—*Jl. Econ. Entom. Concord*, viii, no. 5, October 1915, pp. 492–495.

Much of the matter in this paper has already been published [see this *Review*, Ser. B, iii, p. 148]. A few additional notes are given of the life-history of this flea. Several individuals were studied on the head of a fowl to which they had attached themselves. The males frequently changed their positions at night, but remained stationary during the day. The females remained in one spot throughout life, unless seriously disturbed. Pairing and oviposition took place at night, but not until the fleas have had a feed of blood. After mating, the males lived from two to six days, the females from eighteen to forty, producing eggs up to the time of their death.

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The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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